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**Vengeance 1300**

ANALOG GAMING HEADSET



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# ED HEAD

## Sad days...

I'm feeling kinda conflicted.

In the back of the games section this issue is a preview of Star Wars: The Old Republic, written by Nathan Lawrence based on a demo session he had earlier in the year. I've got our video guy and sometimes writer, Josh Lundberg, telling me that he got some beta time with the game a week or two ago, and that it was hella fun. And last year I got some time myself with it,

and yeah, it was pretty compelling.

And now, as I write this, the game's releasing, and I'm hearing more positive things. Only... it's not available here in Australia just yet.

Hell, EA isn't even talking about it here because of its staged release through different global territories. It's very annoying. We mostly support that; it's a good idea, actually, to make sure that you get a handle on server load and other stuff. It's not stopping some locals from getting the game, either – there's a few Atomicans who have ordered from Amazon or similar, and I guess I could follow that route easily enough. But...

I can't get past this feeling that, while it will basically be no different than the World of Warcraft launch – which didn't have any kind of local integration – nonetheless I'll miss out on the 'proper' launch when it finally does get released in Australia.

Is that weird, or what?

Probably.

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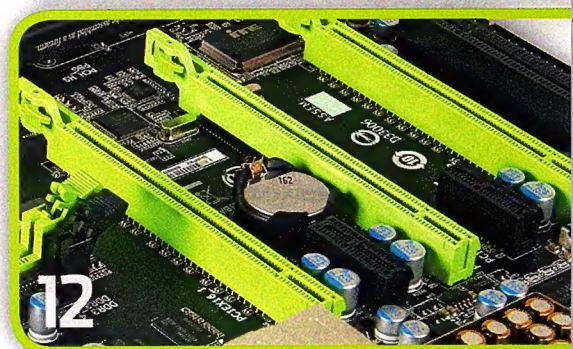
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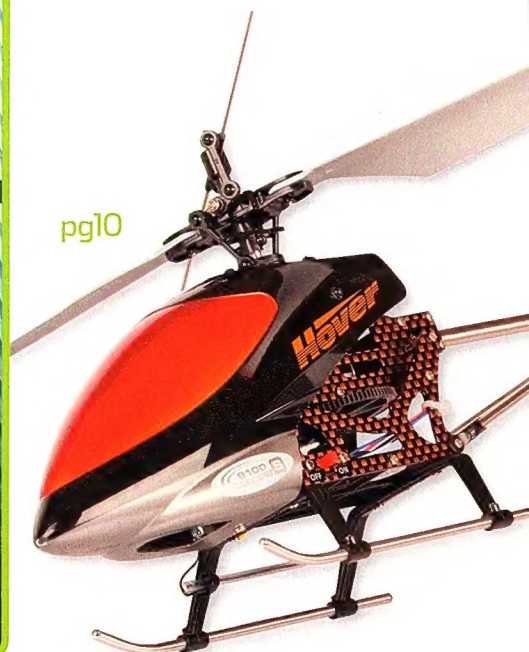
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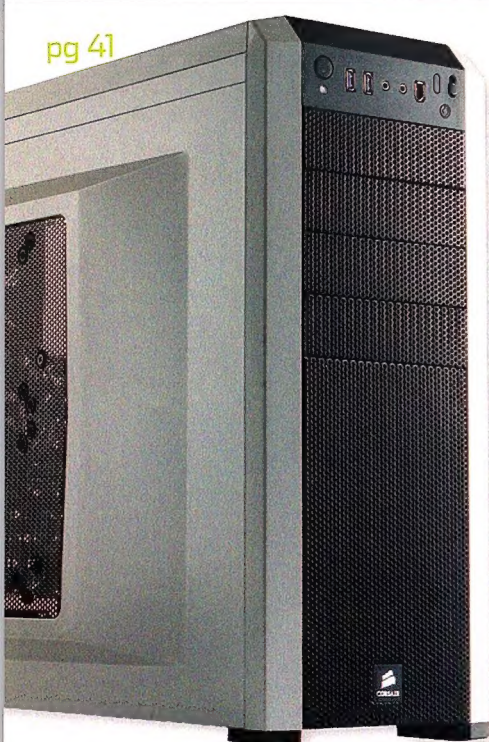




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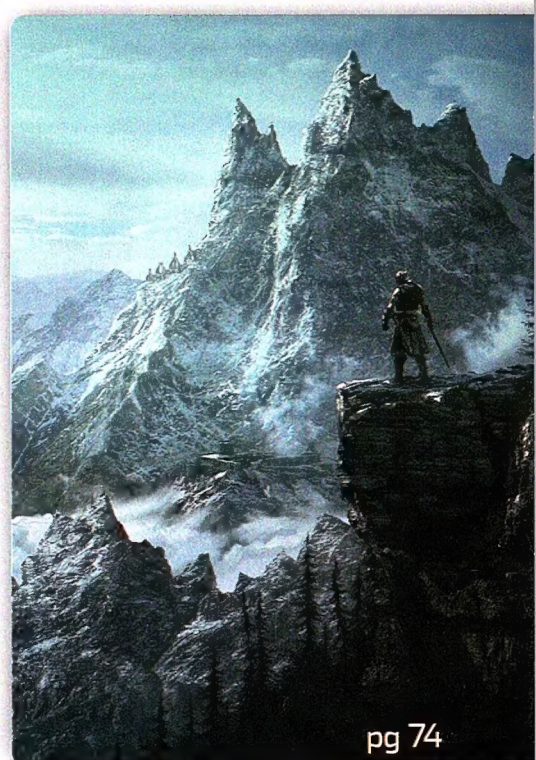
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# WARNING!



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# IndieDB and ModDB announce the best of 2011

75,000 players have voted on the best mods and indie titles of the year over at IndieDB and ModDB – who says PC gaming is dead?

A lot of people feel that the true advantage of the PC as a gaming platform lies not in its hardware, but in just how democratic it is as a platform. It's insanely accessible, and there few brighter areas of that expression than mod-making and indie game development.

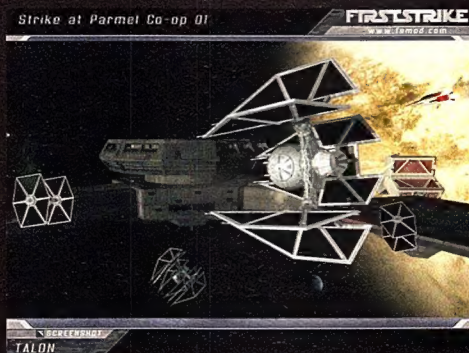
Of course, indie developments also doing great guns on mobile devices, too, but modding... that's pure PC perfection.

And speaking of perfection, the guys over at the IndieDB and ModDB – two sites dedicated to supporting and cataloguing the efforts of devs and mod-makers – have announced their top 100 games ([www.indiedb.com/events/2011-indie-of-the-year-awards/top100](http://www.indiedb.com/events/2011-indie-of-the-year-awards/top100)) and mods ([www.moddb.com/events/2011-mod-of-the-year-awards/top100](http://www.moddb.com/events/2011-mod-of-the-year-awards/top100)) of 2011.

Of course, this is just the first round of voting. Now that the top ranked titles and mods are in, it's time to narrow

down the field to get to the very cream of the crop. Voting was open until the 20th of December, so the final results should be well and truly available by now.

PS: If you're wondering why we have a TIE Defender as the llo for this piece, it's because it's from one of the top 100 mods, First Strike for Battlefield 2142. How cool is that?!



## Confirmed: Australia misses out on new NVIDIA GPU

We've gotten confirmation that the GeForce GTX 560 Ti with 448 Cores will not be heading to Australian stores.

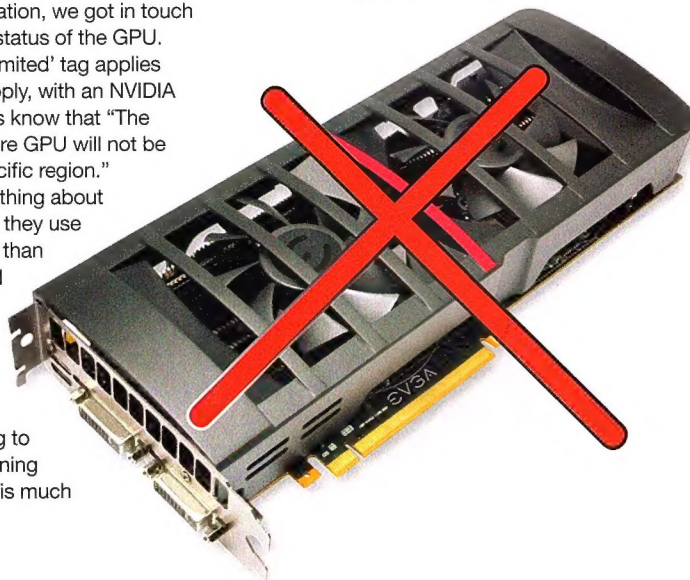
You may have noticed a bit of a buzz focused around a new GeForce GTX 560 Ti GPU that has been unveiled by NVIDIA. Called (we kid you not) the 'GeForce GTX 560 Ti with 448 cores', this GPU sits between the standard 560 Ti and the high end GTX 570.

Not that it matters for Aussies. Wondering why reviews were flowing overseas yet we hadn't seen any information, we got in touch with NVIDIA about the status of the GPU. The answer is that its 'limited' tag applies to region as well as supply, with an NVIDIA spokesperson letting us know that "The GTX 560 Ti with 448 core GPU will not be available in the Asia Pacific region."

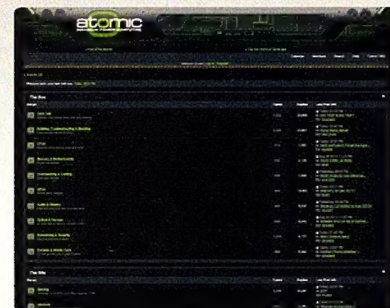
The most interesting thing about these new cards is that they use the GF 110 GPU rather than the GF114 that is found on standard GTX 560 Ti cards. This points to the chips being originally destined for the GTX 580 or 570 product lines, but failing to make it through the binning process for either. This is much

like last year's disappointing GeForce GTX 465 was a cut down GTX 470.

Unlike the GTX 465, the GTX 560 Ti with 448 Cores seems to deliver pretty nice price/performance. Of course, the only way to get your hands on one is ordering from overseas – they won't be appearing in retail stores in our corner of the land.



## FROM ATOMIC ONLINE



It's time to celebrate the best of the forums once again, and give away a shiny new Razer Hydra controller! So who wins this month?

**kikz!** Not only does he get the prize, but he's also burning off those extra calories because we are all fat bastards from over-indulging during Christmas and New Years.

<http://forums.atomicmpc.com.au/index.php?showtopic=46801>

And we have a smattering of runners up, too (may not contain actual running).

**UberPenguin** gets the nod for starting a small but perfectly formed thread on emotions and gaming.

<http://forums.atomicmpc.com.au/index.php?showtopic=46804>

And this goes back to last month, but has been going strong in the Green Room all through this one. Kudos to all the commentors in the Aikido thread!

<http://forums.atomicmpc.com.au/index.php?showtopic=46517>

Thanks for being a part of the forums, guys, and remember to log on for the best gaming and hardware community in the country!





# MODIFICATION

With Ashton "Two mods are better than one" Mills.

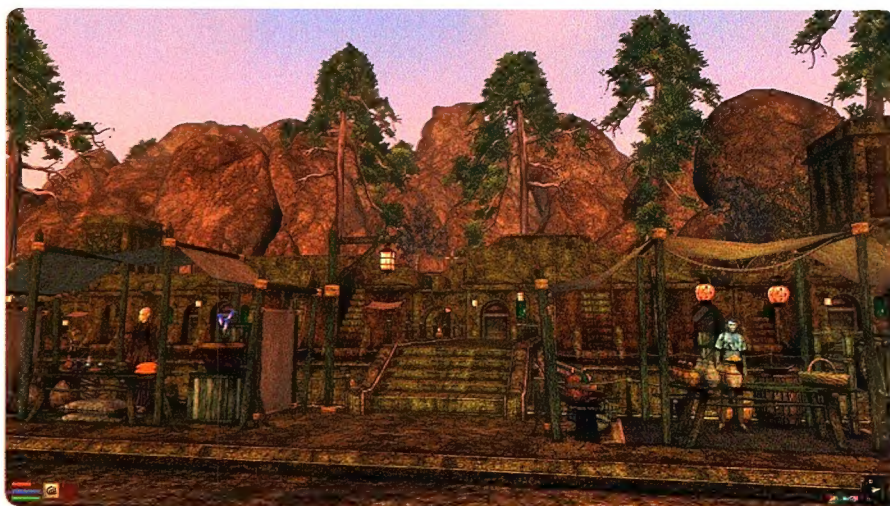
## Morrowind Rebirth

Game Morrowind

URL [www.moddb.com/mods/morrowind-rebirth](http://www.moddb.com/mods/morrowind-rebirth)

**W**ith the release of Skyrim, the earlier TES games are back on everyone's minds. And with Oblivion being seen as the poor cousin to Morrowind, comparisons were inevitably made on the Bethesda forums between Skyrim and Morrowind. Some even claimed Morrowind was *still* the better game. Interesting. Oh, they're usually talking about gameplay, not graphics, although there are plenty of graphical mods for Morrowind too. Some even add shadows that are better than the ones in Skyrim. But anyway! Back to gameplay – Morrowind has its many faults like all Bethesda games, and apart from adding a range of new creatures and equipment, Morrowind Rebirth is primarily about common-sense fixes and changes to the game to flesh out and tweak the underlying game itself to make it, well, new. Born again as it were. Rebirthed. (*I c wat u did thar-Dep Ed*)

Some of the significant changes include loads of bug fixes (like floating objects and terrain), re-balanced spell costs, various weapon and armour rebalancing, rebalanced summons, stacking potions better so they're easier to find, fixing elemental shields, larger mana pools for NPCs, and fixes for various loopholes that made it too easy to get rich. Add to this some new creatures, weapons, new models and textures, and landscape rebuilding (Seyda Neen, Balmora and Caldera to name just a few areas) and the result is a polished version of Morrowind that is, in some ways, closer to the original lore than Bethesda intended. Oh and it even includes four new



sound tracks to boot, which are superb.

Morrowind Rebirth isn't the only mod you should get if you're looking to play again, but there are graphical and sound overhauls available which will blow your socks right off, and it's an excellent base to start with. (5)





# FIFA Manager: Total Reality Mod

**Game** FIFA Manager 11  
**URL** [www.moddb.com/mods/fifa-manager-11-total-reality-mod](http://www.moddb.com/mods/fifa-manager-11-total-reality-mod)

**B**ecause football is life! Even a virtual one. Soccer is, of course, the sport of kings. And hooligans (which is unfortunate). But that's the joy of computer games, no hooligans here! (unless you get griefers in MP). And you can probably add them yourself if you invite a few mates around and get drunk while you play.

And speaking of, what could be better than playing FIFA Manager 11 as a football fan? How about playing it with 40GB of new content? No, that's not a typo, this mod is 40GB in size. Who knew there was so much you could do with a soccer game.

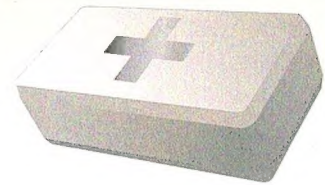
Apparently the Total Reality Mod packs in the resources for 200 countries, 510 leagues, almost 10,000 clubs and 126,000 players from around the world, so chances are no matter who you support, or who you want to play against, they're in here. To go with this there's tens of thousands of team logos, stadiums to play in, host city photos, player pictures, sponsors, trophies, graphic themes and even close to a hundred new music tracks. It's stupid massive.

Then there are the little details like some 3000 new fan chants for on-field experience, tons of phat loot in the forms of cars and boats for players to earn, complete with posh pictures, and even some shots of some 300 famous girls to be your arm-candy. Oh, and you can even choose between eight different flavours of soccer balls for a match. That's attention to detail.

It's fair to say you could play the mod for



years and never see all the content. But it is one heck of an upgrade to FIFA Manager 11 and if you're a soccer nut, you probably know where the next 40GB of your bandwidth cap is going. Just use a download manager, lest your internet disconnects midway. (S)



Assassin's Creed: Revelations  
 - Patch v1.01

FIFA Manager 12  
 - Update 2

Dragon Age: Origins  
 - Patch v1.05

ANNO 2070  
 - Patch v1.01





# GEARBOX

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## Jaycar Helicopters

Price: from \$79.95

Website: [www.jaycar.com.au](http://www.jaycar.com.au)

Forget saying it with flowers – real geeks say it with whirling rotor blades and the potential for injury. These are two things that the new range of RC helicopters from Jaycar

Electronics can deliver to the foolhardy, and that's how we roll.

There's three choppers you can get in the range. The 3460 is gyro-stabilised, 13 centimeters long and can be controlled from your iPhone or Android device – neat! The 3430 is a tiny rotor-powered RC vehicle that features an Xbox-like controller, while the 3360 has a more complete remote, longer charge time, a strong aluminium frame, and is definitely our choice for bombing raids on friends, neighbours, pets and enemies at LANs.



## TEAC DAB800B digital radio

Price: \$169

Website: [www.teac.com.au](http://www.teac.com.au)

There's a lot to like about radio, even though a lot of folks think it's a kind of dead medium. Sure, we'd love to see Kyle Sandilands die of some kind of fiery doom, but let's not paint all of radio with that kind of douchebaggery. We'll certainly be listening to the radio with some interest come Australia Day, when Triple J announce the previous year's Hottest 100 (our best chance to discover what 'the cool kids' have been listening to).

And we can't think of a better platform than this shiny new digital radio from TEAC. The DAB800B (get a better name, guys! (heh, 800B –Dep Ed)) features eight DAB+ station presets and eight normal FM ones, delivers great sound, and comes with inputs for CD and MP3 players.

Seriously, though, the Hottest 100 was SO much better when it was 100 songs of All Time, and The Cure always got ten songs in there. Damn punk kids.





## Captain America: The First Avenger

**Price: from \$39.99 Website: <http://captainamerica.marvel.com>**

If you're not excited about the upcoming release of Joss Whedon's The Avengers this year, we have a simple proposition for you.

You are actually dead.

That's about the only excuse we can think of to not be trembling in anticipation of this super-fest of epic proportions. We're excited, and as part of that excitement we're very happy to now add Captain America to our movie collection, so we can have a proper Avengers marathon in the lead up to this almost unholy geek-gasm. We're picking the two-disc Blu Ray as the best version; it'll look and sound good, an even has a digital copy to take with you on a mobile device, but you can also pick up DVD and 3D Blu Ray versions. With Iron Man, Thor and the Hulk already out, there's few left before the Avengers movie proper!



## Blue Canary in the Outlet by the Light Switch

**Price: \$US12.99 Website: [www.thinkgeek.com](http://www.thinkgeek.com)**

Okay, the reasons for this appearing in a mag like Atomic are pretty tenuous at best. Basically, it's an electronic device that plugs into your wall – just like your PC! So...

Well, really the only reason we've included this is that we think this is just about the most awesome thing that electricity can power, and you will too if you're a 'They Might Be Giants Fan'. If you're not sure who they are, go listen to the song of the same name. If it doesn't make you smile, then you might be in the same condition as the peeps who aren't excited about The Avengers; if it does make you smile, you'll definitely want one of these, a:

Blue Canary in the outlet by the light switch,  
Who watches over you...

## Edifier X600

**Price: 99.95 Website: [www.edifier.com](http://www.edifier.com)**

Sure, we may talk about frame rates and processing power a lot when it comes to games, but really, one of the kickers for a great gaming experience is having access to great sound.

(Also, great snacks, great whiskey, and great pwnage – these are all good too *(and are possibly great -Dep Ed)*)

Edifier's new X600 speakers not only promise to deliver on the great sound part of the equation, but they also bring a certain amount of smile to your gaming environment, with a slick black and white design. These 2.1 speakers boast a 6.5in subwoofer, wooden housing, integrated side panel controls, auxiliary inputs and a total of 40w of power.

Hell, it'll even connect to gaming consoles, if that's how YOU roll.







**Jake Carroll** always connects directly to every device he owns.

Nobody is ever quite sure what the future holds in computing. Many innovators change the game, bring new features and fashion their own reality, but nobody can truly predict the major trends, features and capabilities of hardware ten years out. The inability to predict the features we'll see on motherboards in five years time is most likely a function of how spontaneous, random and innovative the human mind can be. After all, many of our technological innovations were not born purely of a logical progression in manufacturing capabilities. Rather, they were at some point or another the dream of a bright human being and his or her imagination. In the last few years, many things on our motherboards have changed. We've lost PATA ports, we've gained SATA ports, we've got lumps of gunmetal where the Northbridge cooler once was, we've got quasi-optical connectivity on board and we've pretty much thrown the BIOS out. One thing that hasn't changed all that much on motherboards since the late 1980s is the PCI slot. The Peripheral Component Interconnect still has a place. This month, we tell its often-underplayed story.

## A bunch of pins, plastic and gold

The PCI bus has been around for a long, long time. It replaced ISA and other initiatives, neatly unifying and amalgamating a set of standards. PCI gradually changed from a simple 32-bit bus standard, to a 64-bit extended standard (PCI-X),

then to a multi-purpose and astonishingly flexible standard known as PCI-E.

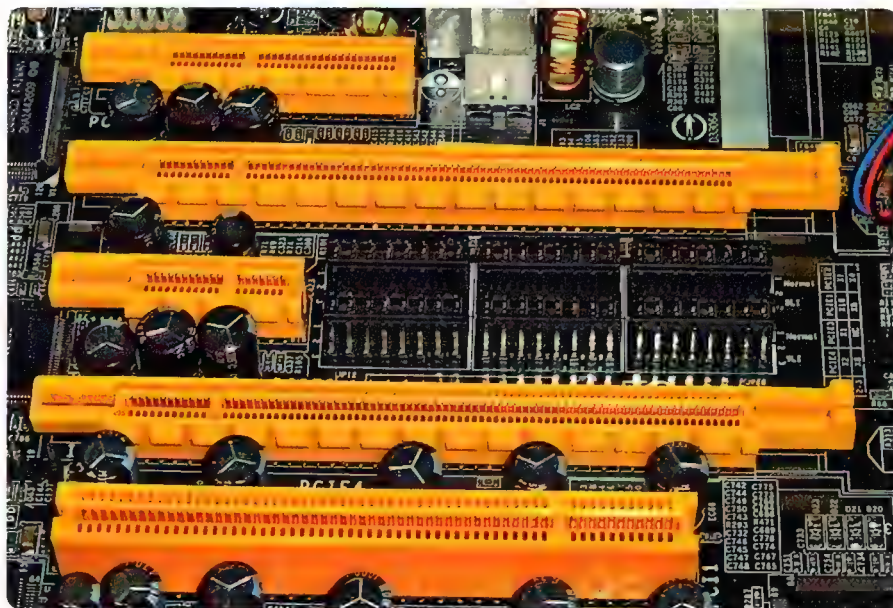
The PCI standard is still so prevalent in desktop, mobile and industrial computing because of this flexibility, architecture and signalling rates.

## The architecture of PCI-E

Conceptually, PCI-E is a high-speed serial signalling device that uses shared address space

and data lines. This seems unintuitive if you look at the base of a PCI-E card. It doesn't look like a serial signalling device at all, rather a device that can transmit many bits of data, or signals, down many paths at once.

From the early days of PCI (which was a shared bus topology), the technology used parallel interconnect; all slots and devices on the PCI bus shared a common set of addresses and control lines. If you had a device on one PCI



[Figure1] Various PCI slots, from top to bottom: PCI-E 4x, PCI-E 16x, PCI-E 1x, PCI-E 16x and conventional PCI (32bit).





[Figure 2] This PCI-E connected RAID card clearly has many pins and signalling points where it connects to the motherboard, yet it is still considered a serial device.

slot (a trusty SB Live! Sound Blaster), and a PCI video card (a NVIDIA TNT2 PCI, for example), they shared communications paths, bandwidth, and interrupts across the entire bus. PCI-E is quite different because it uses a point-to-point topology, with a separate serial link for every device plugged into the board. The clocking and synchronisation scheme of traditional legacy PCI also meant that the entire bus was limited to the slowest signalling device on the board. If you had a device that could only communicate at

33MB/sec, then despite your best efforts, those 66MB/sec devices would not run any quicker than 33MB/sec. PCI-E bests this as it supports full duplex communication from end point to end point, with no factors that impact on the performance of any other device on the bus.

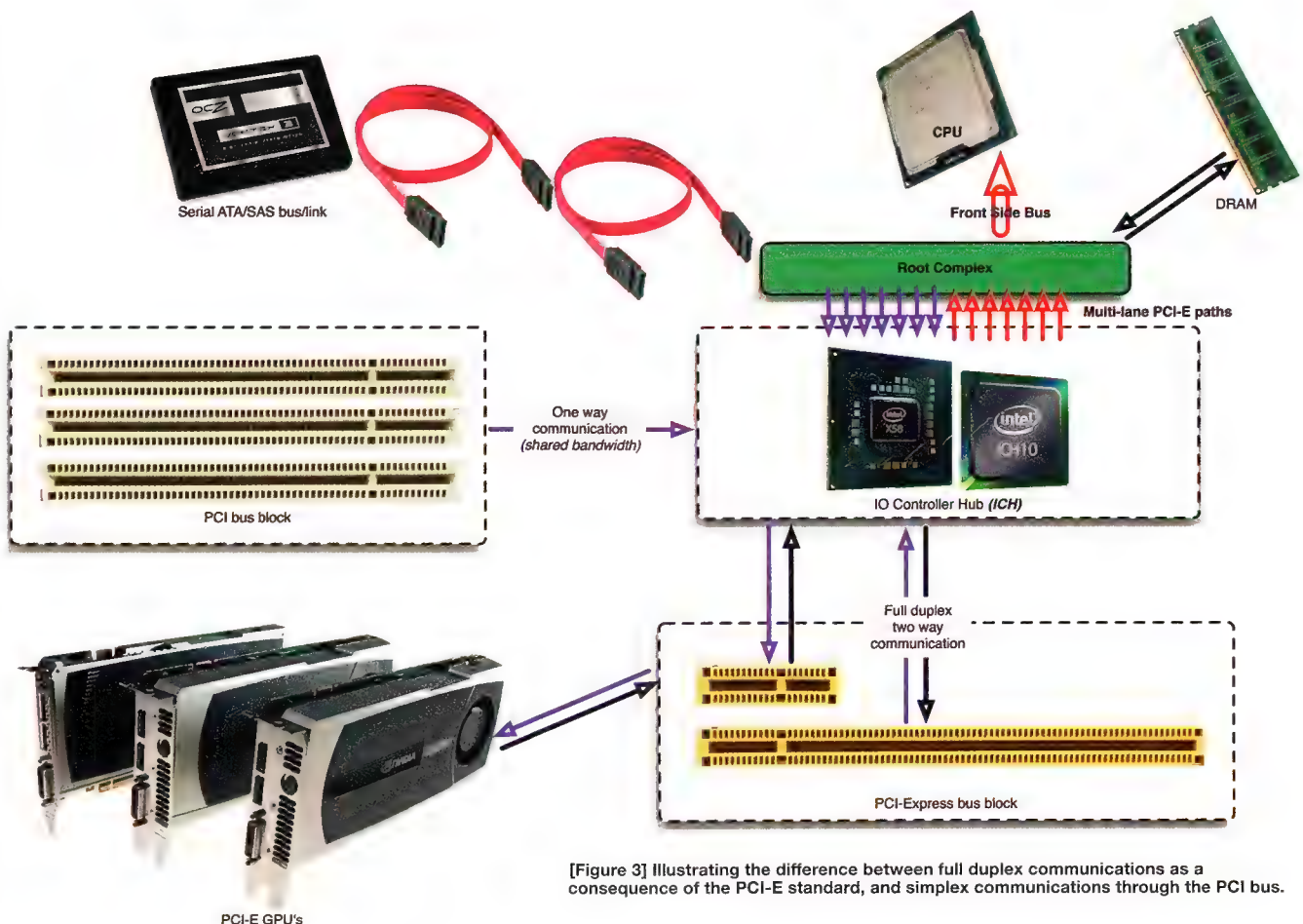
PCI-E has become particularly relevant to high-end workstation, enthusiast, and server class CPU architectures, with the current Intel enthusiast offering (i7-3960X) exhibiting 40 dedicated paths directly from the CPU to the

PCI-E root structure. This is becoming more and more valuable as the amount of bandwidth consumed by devices such as GPUs and high performance storage technologies climb.

## Are you for serial?!

We have yet to establish just why a serial specification was used for PCI-E rather than a parallel technology. The bonded serial format was chosen for two reasons. Firstly, as with any parallel communications, more individual signals are being sent at any given point in time simultaneously. This has a significant impact on power draw, heat, accuracy of transmission, and error generation. Secondly, clock skew at high throughput over different conductor lengths and cable lengths (otherwise known as 'traces' on the PCB) meant that a parallel bus could not be relied upon to deliver the 0's and 1's in order, and let alone being reassembled efficiently. At a very low level, this was happening due to different signal velocities on the printed circuit board. Effectively, the speed at which electrons moved from one place to the next depended upon the conductivity properties of the gold lines on the motherboard they were travelling along; any variance in the lines caused a multitude of synchronisation problems.

The general trend in the computing industry is an across-the-board move away from parallel IO



[Figure 3] Illustrating the difference between full duplex communications as a consequence of the PCI-E standard, and simplex communications through the PCI bus.





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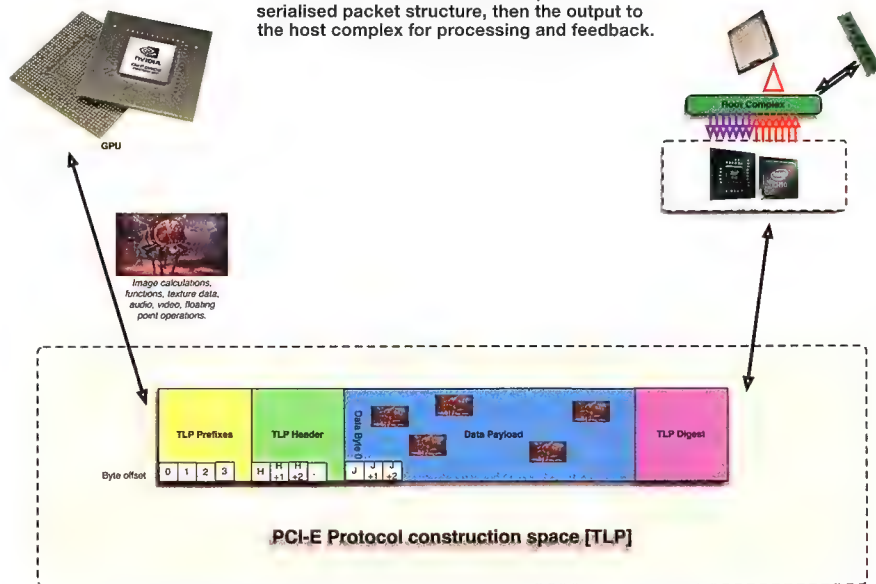
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The TLP link model showing the interaction between a PCI-E connected GPU, the serialised packet structure, then the output to the host complex for processing and feedback.



methods for these very reasons. Other examples where serial IO methods have become prevalent include Serial ATA (SATA), USB, SAS, FireWire and ThunderBolt.

Odd as it may seem, the communication mechanism that the PCI-E bus uses to actually move data around is **packet-based**. A packet of data is similar to a parcel of information being delivered by a courier; it's akin to an extremely high bandwidth network card with many different functions, other than moving TCP/IP packets. The way PCI-E communicates is through **transactions**. These transactions consist of **requests** and **completions**, which are both wrapped inside what is known as a TLP or **Transaction Layer Packet**. These TLPs are broken into several sections: the prefix, header, data payload and TLP digest. This neatly illustrates how PCI-E conceptually transfers information in a serialised stream of bytes.

## PCI-E extensibility

The PCI-E story is a prolific and popular one. PCI-E lends itself well to so many devices that many users never thought could be possible. The Thunderbolt interface (10GbE peripheral connectivity from Intel/Apple) is a native PCI-E talker. GPUs have been PCI-E based for many years now. External PCI-E devices are slowly on the rise. Some vendors have attempted to capitalise on the flexibility of the standard to create modular systems. NVIDIA have a device known as the "QuadroPlex" out to market (pictured right) that effectively offers a GPU in an external box that can be connected over a PCI-E interface.

Wireless PCI-E Systems are also in development of a standard known as WHDI (Wireless Home Digital Interface), for streaming HD video content and networking via the PCI-E bus.

## PCI-E practicalities

We'll walk away from pure theory for a little while and venture into the practicalities of PCI-E and how it's changing the industry. For several years now the enterprise and consumer SSD market has been very focused on the 2.5" and 3.5" form factor for solid state NAND, connected via SAS and SATA ports. Even with SAS generation 2 and SATA generation 3 (both 6Gbps specifications), the capability of an SSD to overwhelm a serially-attached

channel still exists. 6Gbps isn't actually *that* much bandwidth. That's only 768MB/sec. We've all seen what a couple of RAID'ed SSDs of any current generation can do (hint: it's above and beyond 768MB/sec).

There are other factors that hamper SSD growth and performance on a serially-attached cable. Latency plays a major role in the performance of any storage subsystem.

As popular as they are and as lucrative a product as the 2.5" SATA connected SSD is, the industry will realise that this isn't the way forward. The growing trend will be to shift NAND memory from the SSD 2.5" form factor and put it as close to the CPU as possible. This is achieved through the PCI-E interface. Many companies including (but not limited to) OCZ, Oracle, Micro, Fusion-I/O, Pliant and EMC are actively producing NAND modules that connect directly to the PCI-E bus, and present as logical block devices or 'Hard disks' as most people would expect to see them. Unsurprisingly, the latency of this NAND can be lower by a factor of 10. An example of this is a SandForce 2xxx 256GB NAND device connected to a PCI-E Gen 3.0 bus achieving around 112,000 IOPS @ 0.1428ms latency using a 4K workload with a queue depth of 16. Using a Samsung-controlled 256GB NAND device connected over a SATA 6Gbps cable with the same workload yields 14,340 IOPS @ 1.1157ms latency.

While the two technologies are aimed at quite different users, the staggering difference in command timing latency and ability of the host to drive operations directly to the controller and associated NAND is obvious.

To this end, there is a significant industry





focus (especially in the database market and high transactional workload sector) to connect NAND to PCI-E lanes where possible, effectively bridging the gap between DRAM and traditional spinning (mechanical) hard disk. NAND is now fast enough, with enough engineering and controller intelligence behind it, to directly feed DRAM or CPUs without starvation issues, so the industry suggests it should be used as such.

## PCI-E in the future

While mere mortals haven't really got the most out of PCI-E 3.0 devices yet (1GB/sec of IO per lane), the PCI Special Interests Group have announced the PCI-E 4.0 specification. This

bandwidth of some of the largest and highest-end GPU's we have available to us exceed 144GB/sec. With a bus capability of at most (currently) 16GB/sec, we've still got a choke point. Even with the unreleased 4.0 specification, we cannot hope to match the internal IO capabilities of our GPUs, with their utilisation of GDDR5/6 types of memory and architecture.

With that understood, we have to take a step back and think about the types of workloads and applications that these heavily connected internal-processing powerhouses are actually capable of. GPGPU computing (General Purpose GPU) and workload consolidation might be one of those applications. Another might

and 10GbE adapters are commonplace. While Infiniband is extremely low latency and high in performance, it suffers from software stack overheads that are required to keep track of network topology.

PCI-E sits somewhere in the middle ground of highly extensive and flexible technologies, with the trade-off being lack of hot-plug, but an advantage in being easy to connect and manage. The PCI-E standards technically support hot-plug, but in practicality very few server environments allow electrical disconnection of the PCI-E board from a 'live' chassis.

## The actual information superhighway

PCI-E lanes are the real information superhighway. In a few years time we might actually realise the capabilities of the silicon we have. Currently however, we don't have a demand in the consumer (or enterprise) markets to drive 16GB/sec of IO around the motherboard, much less any of the other components on the motherboard being capable of dealing with such a workload. The industry trends suggest consolidation of storage, networking and compute-dense devices onto PCI-E connected silicon, such that all data paths have a more direct line of sight to the CPU and DRAM.

The next big challenge is probably in the hands of developers of applications who drive such intensive IO in applications. If our GPU can utilise 144GB/sec of internal bandwidth on the device, maybe it's about time we started to explore the depths of what can be done with that amount of bandwidth, hoping that when the PCI-E 4.0 and beyond specifications are released we'll be able to take advantage of every bit of silicon. (E)

## This specification boasts throughput of 2GB/sec per lane, effectively allowing a PCI-E 4.0 16x lane to be able to transfer 32GB/sec of IO.

specification boasts a throughput capability of 2GB/sec per lane, effectively allowing a PCI-E 4.0 16x lane to be able to transfer 32GB/sec of IO between the device and host. The final specification for PCI-E 4.0 will not be bedded down until around 2014, but practical applications are already being thought about and sought after.

We find it hard to contemplate at the moment, but GPUs are capable (in theory) of moving 16GB/sec of IO on a PCI-E 16x 3.0 lane. Unfortunately, things break down and the truth behind the numbers (and an industry playing catch-up with itself) become apparent.

Even the mightiest of video cards on the market currently only conform to the PCI-E 2.0 specification. Interestingly, the memory

be more significant use of GPU offloading for system related tasks, giving the CPU time to be utilised on other workloads.

## Competition

PCI-E does stand almost uncontested in the high bandwidth serial interconnect world. There are competitors around the sides that take certain parts of the market for different reasons. RapidIO, Infiniband, StarFabric, HyperTransport and QPI (Quick Path Interconnect) all stand as direct alternatives to PCI-E, but don't have as much mainstream acceptance. The compromise with all these standards is a four-way split. Extensibility and flexibility clash with latency and overhead. A classic example of this is the high performance database industry, where Infiniband

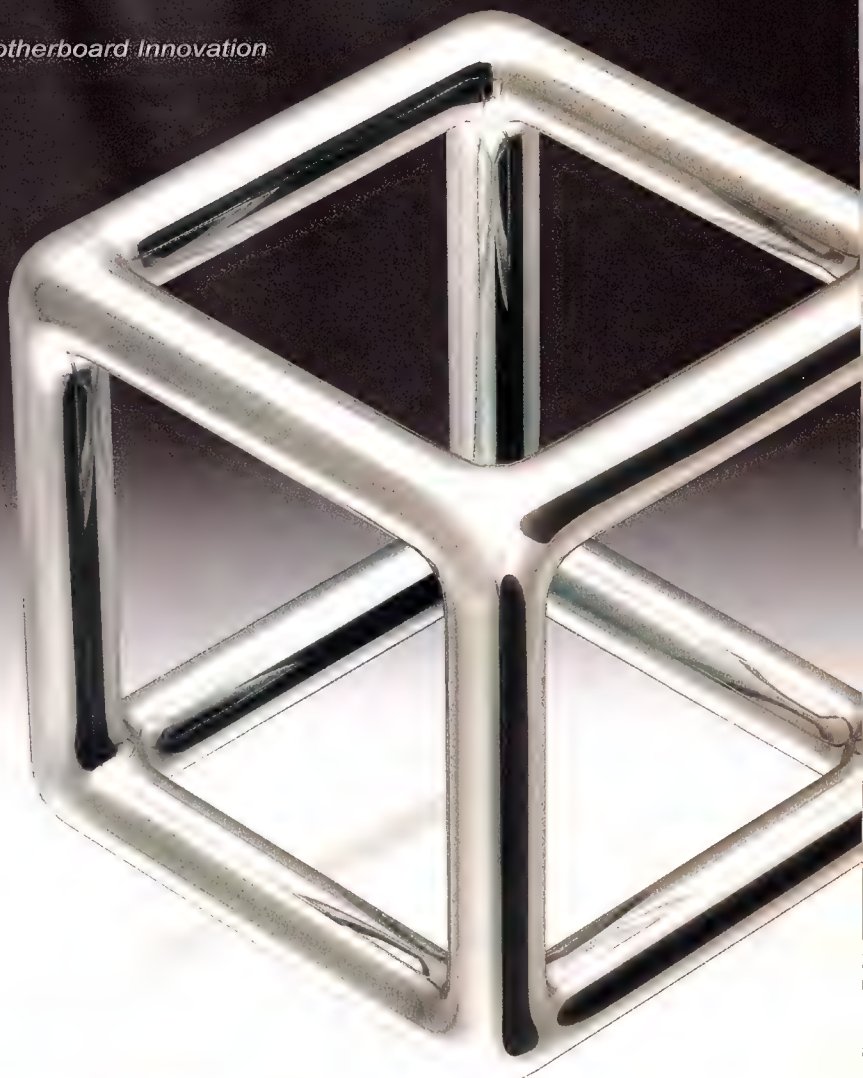


WHDI PCI-E connected GPUs may become a mainstay for truly cable-free households, depending upon the growth rate and acceleration of GPU bandwidth and the ability of semiconductor/radio manufacturers to develop hardware capable of sending signals quickly to other devices without interference. Australia's very own CSIRO are pioneers in this field.



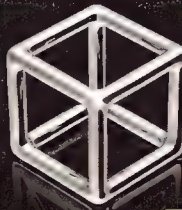
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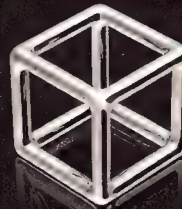


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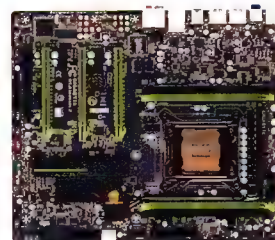
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# INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.



## I/O OF THE MONTH

### Microwave oven not an acceptable substitute

**I** Last week, my old GeForce 8800GT died. Garbage on the screen during boot, didn't make it to Windows. I stole the oldest PCIe graphics card in the world from my dad's computer so I could use 2D mode, and started shopping for a card. Everything I can buy is faster than my old card, which would be nice, but I'd really rather not upgrade right now, for financial reasons.

But then I remembered reading about people who managed to fix flaky video cards by baking them in an oven to reflow the solder.

Put board in oven at 190 to 200 degrees C for 5 to 10 minutes, dry solder joints get wet again, is the theory.

Bugger me, it worked. I'm a believer.

But while I was looking up how to do this crazy thing, I found this page:

<http://bit.ly/v8qNEV>

...from a guy who fixed his LaserJet with the oven trick, but then had to do it AGAIN six months later.

Am I going to have to do that too? It took my card three years before it went wrong; is it going to go wrong again, faster? What actually went wrong in the first place?

L. Garrick

**O** I don't know exactly what problem your card had, but it was probably the solder. In the case of the fellow who has to cook his LaserJet circuit board every six months, it's almost certainly the solder.

Standard old-fashioned electronics solder is an alloy of tin and lead, in a 60:40 ratio.

Tin/lead solder is good because both metals are cheap (with lead being considerably cheaper than tin), the mixture has an easy-to-work-with melting point, and the lead cures the tin of two scientifically fascinating but very irritating habits.

Bad habit one is "tin pest", in which pure tin below 13.2 degrees C slowly converts itself into a powdery grey allotrope that doesn't conduct electricity any more.

Tin's second bad habit is the formation of "whiskers", super-thin metallic hairs that slowly grow out of certain metals and alloys. Tin whiskers can easily grow long enough to electrically connect components on circuit boards that shouldn't be electrically connected.

Tin pest is seldom a problem in the real world, because if the tin is alloyed with almost anything, it won't convert unless it's a *lot* colder, or you wait a lot longer.

But lead is poisonous, and so the electronics industry is moving away from it. It already has moved, in most cases (look for the Pb-free labels on products near you!).

## I/O OTM



WINS A THERMALTAKE CHALLENGER PRO KEYBOARD

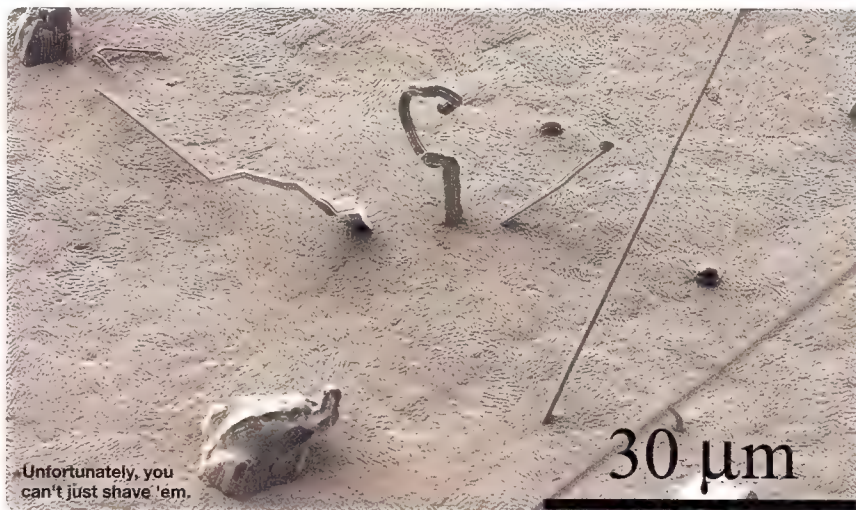
The simplest formulation for non-toxic lead-free solder is just tin by itself, which many manufacturers used in the early lead-free days to coat the legs of components. The solder then used to attach the components to the PCBs was more than 99% tin, <1% copper.

This all seemed to work pretty well. Until a year or three later, when these early lead-free circuit boards started failing at alarming rates. Most electronic devices keeps themselves warm enough to avoid tin pest, but tin *whiskers* grew with great enthusiasm, especially from the pure tin plating on component legs. The ultra-thin whiskers can only conduct a trickle of current before being melted by their own resistive heating, but tiny trickles of current are the standard trade of most integrated circuits. So one tiny little whisker can kill a graphics card, or a whole computer, or a printer.

Old-style tin/lead solder melts at only about 185°C, so you can easily "reflow" a PCB in an oven at less than 200°C. Many hobbyists have dedicated a toaster oven to this task, to keep condensing lead, epoxy and who-knows-what-else fumes out of their actual *food* oven.

The melting point of pure tin is almost 232°C, though, and 99.3%-tin 0.7%-copper solder needs around 227°C. So an oven at 200°C shouldn't be able to melt the whiskers.

Oven thermostats aren't very accurate, though, and circulating air from, especially, the flames in a gas oven, can easily be considerably hotter than the overall oven temperature. So the guy with the LaserJet that needs re-baking every six months probably has a lead-free circuit board that's growing whiskers.



Unfortunately, you can't just shave 'em.



## The Case of the Vanishing Speakers

**I** Every few boots my Windows 7 x64 computer just... loses... my Logitech USB speaker drivers, and has to re-download them. They're just little stereo speakers, not a surround set. I think it happens when I've got other USB stuff plugged in when I reboot, but I'm not sure.

It's not the most annoying thing in the world, but it does make me wonder if there's something going wrong deep in the guts of Windows. I remember stuff being redetected every boot in Win98 so I ended up with 20 monitors in Device Manager, but Win7 only ever seems to see one set of speakers. It just keeps reacquainting itself with them.

Any idea why?

Darwin C.

**O** I can't tell you why this is happening in this one particular case, but I can give you a general explanation.

Simple USB audio devices like a pair of speakers should use drivers that are built into all modern OSes. But this is another of those cases where beautiful clean specifications turn into a snake-fight in a mudhole once the free market's left alone with them for a minute.

There isn't actually a standard USB audio driver in the same way that there are standard drivers for mice and keyboards. It *looks* as if there's such a driver, to Windows users, most of the time. But Linux users know that USB audio devices come in numerous flavours, and may not admit to being audio devices at all.

A set of speakers may, for instance, swear Scout's Honour to Windows that it is in fact a keyboard, on which keys mysteriously never seem to be pressed. When you install the speaker drivers, they reach out to every "keyboard" plugged into the computer and poke them in a mystic Masonic sort of way, and the one that gets the secret handshake right is then connected to the audio subsystem.

But then you reboot with more USB devices connected or things plugged into different sockets. Windows would be perfectly able to sort this out if everything told the truth, but

when all it sees are a bunch of "keyboards" on different sockets, the driver-installation procedure has to be done again to see which of these devices actually *are* keyboards, and which are waiting for a secret dog-whistle.

## Practical network engineering

**I** If I dug a hole through the middle of the planet to the other side, lined it with unobtainium to keep the magma out, and ran a similarly fireproof Ethernet cable through it, how long would it take for the electrons to make the round trip? What would my ping time be?

Jason Bernard

**O** Mobile electrons in a conductor move incredibly slowly. The net "drift speed" is determined by the cross-sectional area of the wire and the current passing through it, but even at high currents you're still only talking millimetres per second.

When electrons move, though, they push the electrons in front of them along, and those electrons push the next one, somewhat like water in a hose. This wave-front of motion propagates extremely quickly – close to the speed of light in vacuum, for an uninsulated chunk of metal. A typical multi-conductor insulated cable still manages something like two-thirds of *c*, or about 200,000 kilometres per second.

A 6,371-kilometre trip at that speed will take about 0.032 seconds, so your round-trip latency, ignoring processing at the far end, would be about 64 milliseconds.

Unfortunately, though, the maximum cable length for 10/100/1000BaseT Ethernet is only a hundred metres. You can stretch that a bit and get away with it, but stretching it by a factor of more than 60,000 is inadvisable.

(A hole dug from Australia would also come out in the Atlantic Ocean, but let's presume you manage to hit the Portuguese Azores or something, and there's someone there who wants to play Counter-Strike with you.)

Your Comic-Book Science Machine could probably make you a superconducting Ethernet

cable, but superconductors only pass *DC* with no resistance, and Ethernet is high-frequency *AC*. So you'd still be stuck with thousands and thousands of repeaters of some sort. Unless you went for optical fibre, of course; I'm sure your Science Machine could also make you an incredibly long fibre of magically non-dispersive glass to do the job. Conveniently, the speed of light in glass is *also* about two-thirds of *c*. So there you go; about 64 milliseconds, round-trip.

In real-world situations, the raw "signal speed" of the cables often doesn't make a big contribution to the total ping time. Satellite Internet is so lousy for games because you're bouncing your signal off something in geostationary orbit, about 35,786 kilometres above the equator. That gives you about 240 milliseconds of light-speed signal propagation time, for the signal to get from you to the satellite and from the satellite back to the ground somewhere else, plus another 240 milliseconds for the reply to get back to you.

(Old-style "one-way" satellite, where your downstream channel comes via geostationary orbit but your upstream travels via dial-up modem, may not actually be much worse in total ping, depending on how much upstream bandwidth you need.)

You'd need 50,000 kilometres of wire to be waiting even 240 milliseconds, connecting to the *one-way* geostationary satellite, for an electrical signal. The circumference of the whole planet is only about 40,000 kilometres.

Real-world network latency comes, instead, from the servers and clients, and from the layers of switching and firewalling between them. Traffic volume has an enormous impact too; little ICMP ping packets can behave (and/or be treated) quite differently from larger TCP and UDP game packets. (This is why pinging a server from the command line can give results quite different from the perceived in-game latency.)

So mere through-the-planet tunnelling machines won't, I'm afraid, give us really snappy trans-planetary gaming experiences. We're just going to have to wait for traversable Lorentzian wormholes. And unfortunately for that plan, poking a Cat 6 cable through a black hole always seems to violate the minimum bend radius.





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# The problem with patches

Patch me once, shame on you, patch me twice...

**W**ith recent furore over Skyrim's bugs, which include the seriously game breaking (crashes to desktop) to the outright hilarious (backward flying dragons anyone?), discussion began on the Bethesda forums about just how much playtesting, or lack thereof, had occurred with Skyrim. And also, of course, bringing into question the skills and abilities of Bethesda's developers.

But Skyrim, despite its state at the time of release, didn't hold a candle to *Sword Of The Stars II*, itself hitting the shelves just a few months before Skyrim. Whereas Skyrim is a complete, but buggy, game *SOTS II* was released to the public in a completely unfinished state. Pre-alpha. It was so bad, a game couldn't actually be completed, there were hundreds of triggers that caused a crash, not the least of which was meeting another player in battle (which is, kinda, the whole point of the game).

Many demanded a refund and got it; die hard fans have held on and wait as the patches come, week after week. After dozens of patches the last few months, the game is still not completely playable.

Which begs the question – what were they thinking? Software is one of the few industries where it's somehow considered okay to release incomplete or broken products. The many excuses bandied about: developing software is *hard* you know, bugs are just *the nature* of the beast. And it's the worst when I hear these from consumers, usually gamers, who desperately hold love for the developer but fail to see how they're being ripped off. The number of pro-Bethesda forumers defending a broken product with over 500 known bugs is amazing. Sorry, but for me, I don't buy it – if you charge money for a product, you and I as consumers are reasonably entitled for it to work as advertised. In fact, under Statutory Warranty in Australia, a manufacturer is bound by law to refund or replace a product if it's not fit for purpose.

There are usually two reasons games are released unfinished: marketing, and (of course) money. Bethesda wanted to keep the 11/11/11 release date, and so released Skyrim when it still had probably another month or two to polish up at least the serious issues. *SOTS II*, it is rumoured (no one really knows the inside story except Kerberos and Paradox Interactive) was getting over budget and Paradox forced its release to recoup costs. But this means that *SOTS II* was badly managed, either by Kerberos or Paradox, neither of which is a problem that should be lumped on the consumer; there's nothing like laying down \$60 for a game you can't even play. And ultimately the damage to the brand may be enough to sink any future Kerberos products, and maybe the company. Bethesda suffered plenty of backlash too, and while many swore never again to buy a TES game, somehow I think Beth will survive this one.

The bottom line remains, however, that if a product isn't up to scratch, then simply *don't release it yet*. Swallow some of your profit forecasts, employ more programmers or use the ones you have over extended deadlines. Buggy software is not one of the immutable truths of the universe, it is completely preventable.

Would Beth have copped some flack if it missed its 11/11/11 deadline? Sure, the gaming world would have had a laugh, but not as much as it got for releasing a heavily bugged game. And, if it had waited, the follow-up reviews, fan base, and ongoing brand loyalty from releasing such a near *perfect* game would, without a doubt, be worth far more monetarily now and in the future.

Unfortunately, in a twisted way, for Bethesda at least the very ability of the engine to be so extensible and allow players to mod the game probably doesn't contribute to the quality of the release – why spend tens of thousands of dollars fixing bugs when the modding community will do it for you, at no cost?

It's worth noting I've only mentioned two recent games, but the practice is rife. The patch mentality of release now and patch later is, unfortunately, well entrenched in game development. And there's not much we can do beyond, perhaps, not buying games on release day and emailing the developer to say why. If the message gets through, perhaps our games will arrive glitch free and we can spend more time enjoying what we paid for than scouring forums for fixes.

In the meantime, if you have either Skyrim or *SOTS II*, give it a couple of months before diving in and you'll be rewarded with an experience of the game as, I'd like to think, the developers originally intended.

Ashton doesn't need any steenkin' patches!  
[amills@atomicmpc.com.au](mailto:amills@atomicmpc.com.au)









# HARD TIMES

# for *Porn*

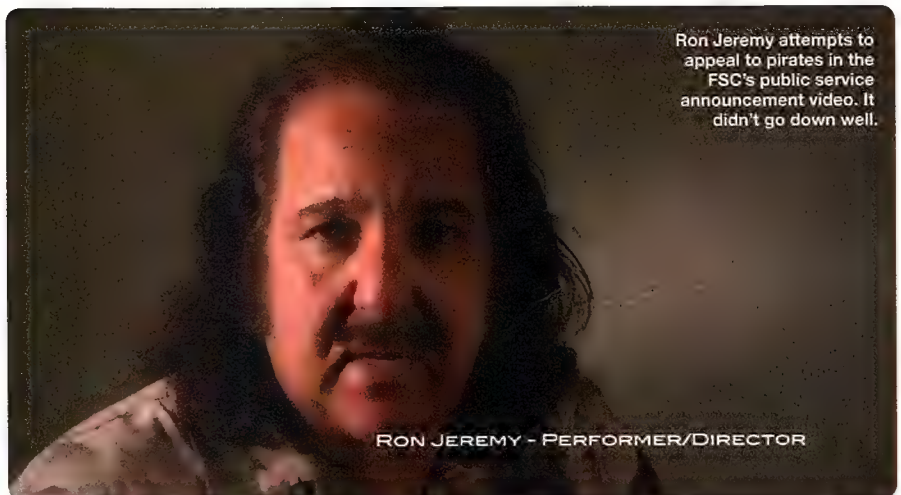
Piracy has hit the adult entertainment business hard. An industry that was once home to lavish parties, flashy cars and ostentatious houses is now slashing its staff and even working with its former enemies. **Ben Hardwidge** looks at how the porn industry is struggling to survive

**O**n the list of topics you don't want to discuss with your parents, porn is probably pretty high, no matter your age, gender, or sexual preference. Nevertheless, it was a conversation about porn with her 20-year-old son that prompted Diane Duke, executive director of the Free Speech Coalition (FSC) – the US adult entertainment industry's trade association – to realise how people perceived her industry.

"No one ever wants to hear their mother ask them this," she admitted to me at the XBIZ trade show in London, "but I asked him whether he

paid for his porn." His response was apparently "I think so," which she says really meant no. "And he's a really honest person," says Duke. "He buys DVDs and he actually buys music, but for some reason, he didn't buy our movies. So when I started asking him why that is, he said, 'Well, you know, it feels sleazy,' and I said, 'That's interesting – it's less sleazy to steal than it is to purchase adult films.'"

It's a common mantra repeated by David Mitchell's character Mark Corrigan in *Peep Show*, who tells himself that downloading porn is fine if you don't pay for it. Despite the need to pay



Ron Jeremy attempts to appeal to pirates in the FSC's public service announcement video. It didn't go down well.

RON JEREMY - PERFORMER/DIRECTOR



porn star salaries, not to mention the costs of filming and lighting equipment, as well as web developers, there's a general feeling that it's fine to download porn for free, and not just because it's perceived as a "sleazy" industry.

Duke recalls a radio show she heard in which the DJs were "talking about some public figure whose wife was divorcing him, because there was \$3,000 of adult entertainment charges on his credit card. However, the whole conversation wasn't even about the issue; they were basically saying, "What an idiot! Who pays for porn?" and that was from two professionals involved in the media. So I realised, with that and the conversation I had with my son, that it was time to say this is enough."

According to Duke, these events inspired the organisation to create its own public service announcement videos, one of which famously went viral around the Internet last year.

It features a number of top-name porn stars, including Ron Jeremy and Julie Meadows, trying to appeal to their audience to stop downloading porn illegally, and explaining the negative impact that piracy is having on their industry. The video is viewable online at: <http://tinyurl.com/PornAppealYT> (safe for work).

Not surprisingly, the video was widely lambasted in various blogs and comment sections, and Duke says she even

received death threats from people who had seen it, while the stars of the video were routinely referred to as "whores". However, in a way, this all proved FSC's point – people think it's okay to pirate porn, and don't seem to have a lot of sympathy for people who have sex on camera for a living.

Despite the negative reaction, Duke says she doesn't regret making the video, simply because it started people talking about the issue. You don't need to sympathise with porn stars and producers to understand why piracy is a problem for the industry; if the finances don't add up, you're simply not going to get the same content.

More than most entertainment industries, porn is particularly vulnerable to piracy. UK-based porn marketing consultant Damian Jennings, whose many clients include Playboy UK and Babe Station, explained to us that the



The FSC's executive director, Diane Duke, says a conversation with her 20-year-old son made her realise how piracy was perceived in the adult industry.

**"As an industry, we really did screw over a lot of customers by being greedy and stupid, and not treating them with any respect"**

FSC video "seemed laughable – like when you see the MPA and RIAA saying, "If you keep doing it, then no one's going to make any more films!" But look at the American box office – don't be ridiculous – of course they're going to keep making films, but it's not the same with porn."

There's no box office revenue from porn, and Jennings points out that "there just aren't the revenue opportunities that there are with, say, music, where the artists get virtually nothing, and the record labels make their money from merchandise and touring. Porn people can't do that, unless you're Jenna Jameson. So if you're pirating the only thing they sell, that's their one shot at making money. If the product is that content, and people can now very easily find that content for free, it's difficult to justify asking somebody for £20 a month, or £3 a film."

Piracy isn't the only issue that affects the industry either. Fiona Patten, convenor of Australia's Sex Party and head of the Australian adult entertainment trade association, Eros, explained to us that "we could be producing better quality and more interesting content, but we're held back by conservative lawmakers and constant attacks from vocal religious minorities. We need the consumers of the product to support it and that means them paying a little." Basically, this is an industry that absolutely needs

money coming into the bank in order to survive, and that's difficult to achieve in a world where you can obtain free porn so easily.

## The impact of piracy

So how has piracy impacted the adult entertainment industry? That isn't easy to gauge accurately, as most of the large businesses in the industry are private companies that don't share their profits and revenues, but Steven Hirsch, founder and co-chairman of Vivid, plainly told us that "the availability of free porn has caused a downturn in sales and profits, and this will cause some studios to close."

A walk around the XBIZ trade show, where porn companies discuss technology and how to make money with various business partners, also revealed to us a show that's very far from what we expected. Where are all the booth babes, we wondered? Where's the massive exhibition floor? It's not that we necessarily want these features – they're traditional staples of these types of event – and we were surprised at their absence.

This, according to Jennings, is one of the key indicators of how piracy has affected the adult entertainment business. "I've been going to America every year for the last six years to go to trade shows," says Jennings, "and they've dwindled. They used to have lots of big exhibitions with lots of big companies, and now there's no exhibition floor at all.

"There are a couple of seminars, but they haven't got the exhibition floor because exhibitions are like willy-waving sometimes – it was like "I'm going to drop this amount of money on this booth, and have these important booth babes," and no one's doing that any more. There used to be competitive parties in the



Fiona Patten, convenor of Australia's Sex Party, says that consumers need to support the industry by paying for it, as it's already being held back by conservative lawmakers and vocal religious minorities.



evenings in a trade show, and now there's just one over a three-night trade show. The companies that are present are getting smaller, and advertising budgets have been reduced massively."

Jennings also points out that the number of employees at many companies has been slashed, with one firm's staff dropping from over 40 employees to just seven. He also says that New Sensations, which is famous for making porn parody films based on real movies such as *Batman* and *Star Trek* (and he particularly recommends the one based on *The Big Lebowski*), has also had to make large cuts to its staff.

This surprises us, as the parody films are sometimes cited as a part of the industry that's still profitable. However, Duke points out that "just because the parody films are successful, it doesn't mean we have revenues like we used to. You have to realise that everything these people touched would turn to gold back in the day – everybody had massive cars and huge houses, but our whole industry has shrunk."

## What goes up...

"Back in the day" is a phrase we heard a lot while researching this feature. There's a feeling that the honeymoon is well and truly over in the business, and there's a lot of pining for the old days. This isn't just a problem of managing expectations though. Some also think that the halcyon age of porn (around ten years ago) resulted in many parts of the industry becoming greedy and exploitative while also resting on its laurels, which in some ways made piracy even more appealing.

"Ten years ago, when the industry really was a licence to print money, there was a huge amount of cash," says Jennings. "The dodgy companies helped to educate people as to why they shouldn't pay for porn. You'd get things like the phone dialler scams, where you'd dial a number that was actually a premium rate number, and leave it connected on your modem for six hours while it ran up massive bills.

"There was also card banging, where you'd join a website trial for \$1 and cancel before it rebilled, but they'd rebill you anyway, and six months later, they'd hit you with another \$90 charge. And there were hidden pretext cross sales, where you join a website for \$10, and you just don't see down the bottom that there's some tiny small print that says, "By joining this you also agree to whatever." As an industry, we really did screw over a lot of customers by being greedy and stupid, and not treating them with any respect, so it isn't surprising that they went elsewhere rather than giving us any money."

This behaviour had a detrimental effect on the business, not just because it prompted many to embrace piracy – it also tarnished its reputation. "One area that the industry pioneered, and to a degree probably exploited, was online payment systems," explains Patten. "The systems were successful but some people in the industry unfortunately exploited that, and chargebacks became a huge problem. This led to the banks

## Porn's Urban Myths

**Porn was responsible for the early development of new Web technologies such as Flash and streaming video.**

It's often said that the adult entertainment business was the primary driver behind new Web technologies in the early days, and the original purpose of this feature was to research the ways in which the industry had shaped technology. However, the more we investigated, the more we failed to turn up tangible examples. There are plenty of articles on the Web stating it as a fact but not giving any examples.

We put the question to freelance porn marketing consultant Damian Jennings. "VHS and Betamax were rumoured to have been invented because of blue movies," he tells us. "At that time our industry had little cinereel projectors for pornos at stag parties and stuff, and there are also completely apocryphal tales about the failure of Betamax. One is that Sony wouldn't allow porn on it, which does make sense, and the other one is that it wasn't long enough to record an American football game – VHS had the extra hour that Betamax didn't."

He told us that technology such as two-way video conferencing is likely to have been driven forward by the industry, but can't think of any examples when we asked for them. "Maybe it's just a myth that porn drives technology," he said, adding that he'd post on the B2B porn forums and ask if anyone has any examples. Two days later he emailed back saying "It seems you're right, and the whole porn and tech thing is bollocks – no one can think of anything!"

That said, there's plenty of technical innovation going on in the business; it just isn't the sort of innovation that's changed the mainstream Web. From RealTouch to interactive cam shows and anonymous

and secure credit card billing systems, this is certainly an industry that's prepared to technologically innovate.

**Only the older generations pay for porn, because they're not tech-savvy.**

Along with interactive entertainment, another profitable new area for the porn business is mobile content. Jennings says that his client Cellcast is "seeing a huge upswing in people paying for small amounts of content on mobile phones, and paying quite a lot – such as a few dollards or a single picture." What's really interesting, though, is the information about the people who pay £1.50 for a single picture.

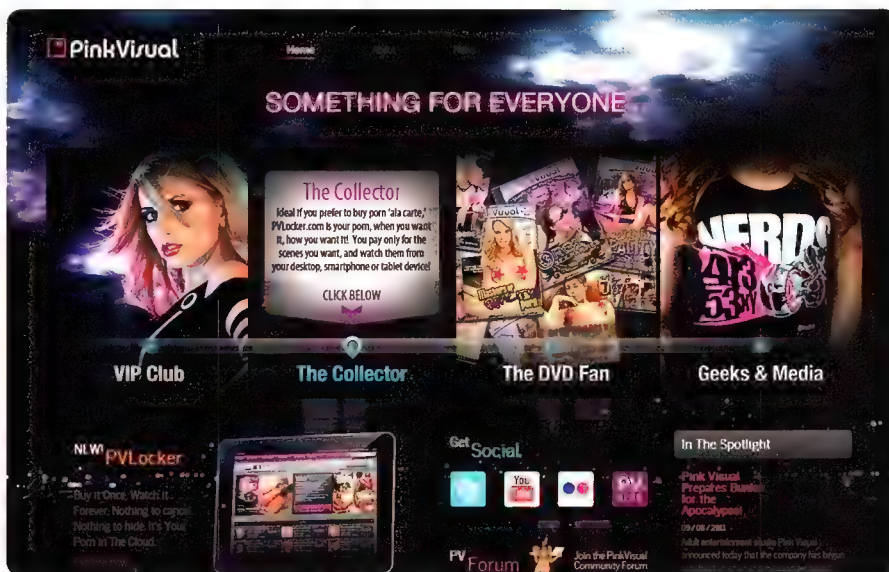
"I asked them last week what the demographic was for the people who were doing that by phone," he says, "and it's young people – 18-25 year olds, and I would have thought they'd be much more canny in knowing how to get it for free. I thought it would be much older people who were paying because they don't quite get the whole Internet thing, and don't understand piracy. Maybe it's because they don't have credit cards, or they just want anonymity."

**Porn makes up over half the content on the Internet.**

It's often said that porn makes up most of the content on the Internet, and you only need to carry out an unfiltered Google Image search on almost any subject to see that there's plenty of adult content available. However, author Ogi Ogas recently performed extensive research on Web statistics for his book *Billion Wicked Thoughts*. He found that of the million most popular websites in the world, only 42,337 of them were adult sites. What's more, in 2009 and 2010, only 13 per cent of Web searches were for adult content.







Cloud services such as Pink Visual are now starting to appear which, like Steam, enable you to access your purchased content from any device that will let you log in.

and credit card companies backing away from the industry."

That said, Patten claims that the days of exploitation are now over. "Our industry is becoming less sleazy," she says. "The days of overcharging, spamming and so on are gone. It's now far safer to spend a few cents and purchase adult content than it is to risk some of the malware from the free and share sites."

## Down the tube

The porn business is also affected by a very different type of piracy from the film and music industries. Of course, torrents are an issue, but the primary concern is "tube" sites. There are numerous examples, including YouPorn, XHamster and so on. "Bit-Torrent is still a problem," Steven Hirsch from Vivid explains to us, "but it isn't as convenient to use as the tubes." As with the most famous tube site, YouTube, you only need to click the play button on an adult tube site to view a free porn video.

"In order to use torrents, even nowadays, you still have to be slightly geeky," claims Jennings. "What's a RAR file anyway? Do you know what I mean? Okay, so you can go to Google and search for 'how do I download a torrent?', and you don't have to do the whole port-forwarding thing any more, but it's still in the realms of geekiness, and you still have to know a little bit about what you're doing. With all the tube sites, you just click and they stream it to you, so there's nothing to do except enjoy the – quite often stolen – content."

In theory, content owners in the USA can order tube sites to remove copyright content via a Digital Millennium Copyright Act (DMCA) takedown notice, and site owners have to comply by law. In practice, however, there are so many tube sites with so many videos in so many countries that most businesses simply don't have the resources needed to comb

through them looking for their content.

According to Jennings, the thousands of users who access a tube site basically "join a pay site, download all of the content, cut it up into snippets and then post it up on to the tubes illegally. So all of the content that they had to begin with was stolen, and they were legally allowed to do this as long as they

responded

to the DMCA takedown notices. The tube sites have now built up this huge amount of traffic, because everybody wants free porn, and it was all on the back of just stealing other people's work and uploading it".

We ask him what you can do to combat such a threat. "Nothing," he replies. "That's the problem. You can try to work with the people that are responsible for it, but what's happened now is that a company called Manwin has bought up a lot of the tube sites. Manwin pretty much owns the Internet at the moment in terms of adult traffic, and it's bought up all of the dodgy tube sites and said, "We're now legitimate, and if you spot any stolen content, send us a DMCA and we'll take it down straight away." But it's too late now; they've done it – they've kind of won, and I would guess – we haven't had the actual figures – that around 70 per cent of adult traffic is now owned by Manwin."

As you can imagine, the development of tube sites was very unpopular in the adult entertainment business. "At the 2008 XBIZ conference, I was on a panel on piracy," recalls Fiona Patten. "There were a number of tube site operators there and chairs were literally thrown in the conference hall. People were mad as hell that these sites were enabling people to upload and share copyrighted material and then profit from the massive traffic they were attracting."

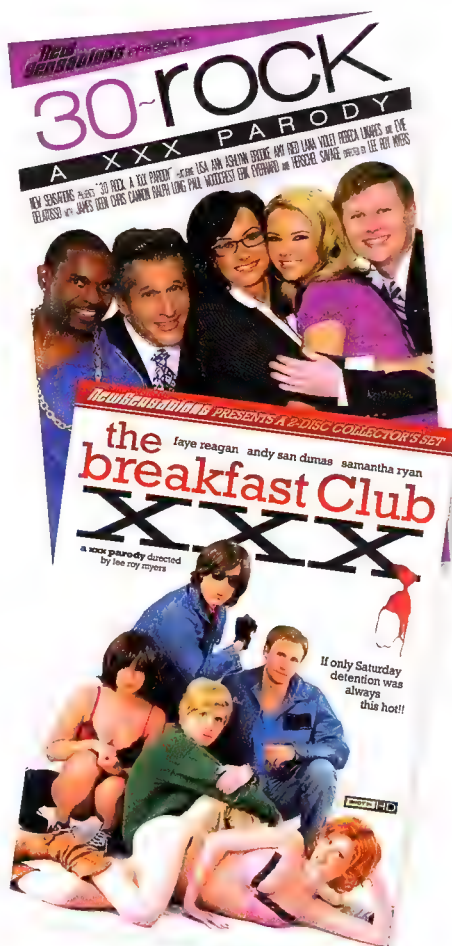
If, as Jennings says, the tube sites have in effect won, how can the industry survive without the necessary resources? Hollywood can get around this by purchasing expensive software that monitors tube sites for them, and detects their content for appropriate action. However, this isn't so easy for the porn industry.

"The first thing we wanted to do was take a look at targeting sites," said Diane Duke when explaining the background of the FSC's new anti-piracy scheme. "But when we started trying to find out what content was on these sites, we realised that even some of the bigger companies didn't have the systems in place to perform the proper searches for the content."

"We knew that there was software out there, because Hollywood uses it, and we're in the same area around Silicon Valley, where a lot of great technology is being used. Early on, I talked to some of the technology companies, and asked what a typical rate was for their services, and they said \$30,000 a month." She gives me a look of horror as if to say that no one in her business can afford that kind of money. "Even our bigger companies are not anything as big as NBC and CBS, so we kind of got stalled there."

The solution to this problem was to do something that had never been done before – encourage the big players in the industry to act as a whole. Together, they bought access to a fingerprinting software firm called Vobile. "We purchased that as an industry," says Duke, "so even the smallest of our companies can buy into it and have some of their content protected."

Duke explains that the software fingerprints the audio, video and metadata in the video files,







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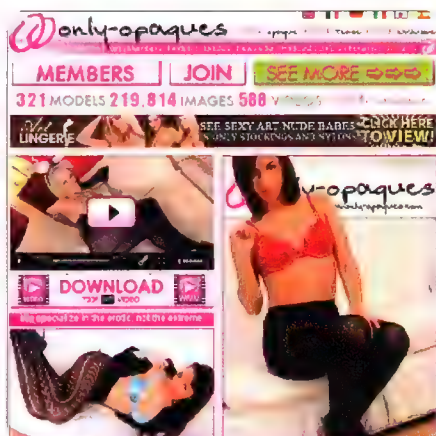
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Niche sites such as Only Opaques are easier to profit from, as the material isn't so widely available on tube sites.

and then matches it with those on tube sites. According to Duke, the software is incredibly accurate. She recounts a time when "Vobile was live-streaming a football game and checking it at the same time, and a guy was live-camming himself while he was working, and in the background they had the football game – Vobile's technology picked it up because of the audio, and picked up this video of this guy just working!"

## If you can't beat them off, join them

What followed is one of the most interesting recent developments in the adult business. After effectively admitting defeat in the battle against the tube sites, the industry could now work with them rather than against them. With the recession biting into online ad revenue, tube sites weren't making as much money as they were, and the porn industry saw an opportunity that could benefit everyone.

The idea was that the tube sites could avoid being sued by working together with the legitimate adult

entertainment business as an "affiliate partner" and, according to Duke, most of the big ones are now on board. The way they work together depends on the agreement – Duke says that some sites aren't interested in the monetisation aspect of the agreement, so their sites just automatically block fingerprinted content. However, many tube sites have apparently taken up the FSC's offer of making money from their sites.

Duke gives the example of a workable money-making agreement, where someone tries to upload a copyright movie to a tube site. "After they upload it," says Duke, "instead of that whole video going up, what goes up instead is a truncated version, or a trailer with an overlay ad that says 'buy it here'." Although the project has only just started, Duke says that it appears to be working.

The system doesn't work like typical web ads either. "Unlike the mainstream, where if you promote eBay or Amazon you get a small percentage of the sale," says Jennings, "in porn, it's 50 per cent. So if you set up a free site, buy a domain and I give you all the content, links and all you need for the tracking, you can set up that website, promote it and then receive 50 per cent of the sales you send me for the life of the membership; if they stay for a year, they get 50 per cent every month."

Duke points out that not only can both parties make money this way, but using the analysis software you can "look at the pieces people steal and see the content that people are interested in, so it's also great marketing material". It's an amazing partnership when you think about it – it would be like Metallica working with Napster in 2000.

It all sounds ideal, but there's a catch. "They send through huge amounts of traffic," says Jennings, "but the ratios are crap. If someone's coming through a tube site, they've come from a place where they get the content for free; you're on a tube site, see the content, click on the banner ad and go to the pay site – out of 5,000 people who go through that process, only one of them will buy. To put it in perspective, if you do it through Google Adwords, you'd probably get one in 200."

## Alternative business models

The affiliate scheme is one approach to combating piracy, but the adult entertainment industry is exploring plenty of other avenues of making money. Anti-DRM campaigners often express frustration when the movie and music industries directly equate a pirated file with a lost sale, and the porn business learned this lesson early.

"When you look at three million views of a clip, you can see the producer looking at the numbers, and I always have to say that you're doing the wrong numbers – you're not going to get a \$30 purchase from all those people," says Duke. The next step, she says, is to



Vivid's Steven Hirsch: 'Porn has been around since the days of the caveman; it's just a matter of working out how to profit from it.'

offer something tempting to the people being redirected from the tube sites. She compares it to an iTunes-style business model, where instead of subscribing to a porn site, you just purchase the material you want for a one-off micropayment.

"Apple proved that if you packaged the product in the right way, deliver it to people in a way they want to get it, and price it at the right price point, you can turn around the tide of piracy," says Jennings. "Without a shadow of a doubt, iTunes had a massive impact on the amount of people downloading illegal music, because it made it easy to do for an acceptable price."

"Now, if the adult [entertainment] people could learn from that, I think that would be a better use of money – making a better product and finding a better platform to put it on. Like the way Netflix works in America, where you can send it to your phone, iPad or PlayStation or TV box; you can do whatever you want with it – you have the content, you've paid for it and you can consume it in whatever way you want."

The problem, says Jennings, is getting the big players in the porn industry to work together, but given the FSC's success with its APAP (Anti-Piracy Action Program), this isn't out of the question now. After all, even Playboy has announced that it's working with Manwin's tube sites. "Everybody said there's no way they'll all play nicely in the music industry," says Jennings, "and Jobs got them to do it. So if there was an opportunity for somebody to go up to Playboy, Hustler and ten of the big players, and say, 'Look, let's just try this; let's price all the porn at 20p, put it on this thing and see what happens,' then you might catch some of the people that





are currently using piracy.”

The industry is also already exploring the potential for cloud-based services. Patten cites the example of Pink Visual – a Steam-like service that enables you to purchase adult content and access it from any device that lets you log into the service. In addition to the standard subscription model, it also offers the option to purchase only the scenes you want on a one-off basis, while also selling merchandise.

## Interactive content and niches

The other areas in which the industry is investing are niches, mobile phone content and interaction. Traditional porn movies with two people having sex are easy to find for free on tube sites and BitTorrent, but it's harder to find well-made material for specific fetishes without paying.

"That doesn't really work on tube sites," says Jennings. "If you like feet, then you're not going to get good foot content on a tube site, or if you are then it's not going to be shot very well and there won't be much of it. It will be easier for you to go to a foot fetish website and pay.

Traditional porn movies are easy to find for free on tube sites and Bit-Torrent, but it's harder to find well-made material for specific fetishes.

"There are also micro niches – there's one I know called Only Opaques, and it's just girls in opaque stockings. Another friend of mine does one called Wet Look POV, where it's a girl getting wet in a shower with her clothes on. That's how the clever people are now thinking."

The other new way for the industry to make profit is via interactive entertainment. Instead of watching an adult movie, you pay to watch people on a live cam, and interact with them via a chat window, telling them what you want to see them do. Of course, people can record the video stream and upload it, but you can't pirate the excitement of a live experience.

The industry is also exploring new ways of using technology to improve the interactive experience. "One of my clients is called Cellcast," says Jennings. "It has a cam site called Party Chat, and there's a nice tech feature in that. Normally, you're using laptop speakers and microphone to talk to a girl, and it's crap, so they came up with the idea of using your mobile phone as the speaker and microphone.

"So you're watching a girl on your laptop screen, but the phone is the speaker and microphone, and you get a much better experience. It's not crackly, there's no feedback, and it's not like where you have a crap microphone

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controlled by a computer, and synchronised with a movie. "That's an interesting device," says Duke. "I saw one of the first people demonstrating it; they were sitting at the table with the RealTouch machine and the video playing, and people would walk by and say either "ooh, wow" or "eughh"."

Jennings falls into the latter category, telling us that "I wouldn't go near it – it would be like putting your dick in a lettuce shredder," but devices such as this could potentially turn around the fortunes in a struggling industry. Combine a device such as RealTouch with a live cam show, and you have an interactive experience that's impossible to pirate.

## Will the industry survive?

It's obvious that piracy has had a major effect on the adult entertainment industry – perhaps more so than any other – and this has led to some very interesting ways of tackling the problem, including forming partnerships with former pirates and innovating with new technology. The golden age of making untold riches from porn has passed, probably never to return, but the industry is determined to survive.

"Porn has been around since the age of the caveman and will be with us in centuries to come," explains Vivid's Steven Hirsch. "It's always been a matter of figuring out how to make it profitable. With the development of more advanced technology, we'll be among the studios left standing and will be even stronger." 





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# HARDWARE

## NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

It's a brand-new year, with the major CPU releases behind us and only new things to look forward to! We'll see an evolution of Intel tech, possibly Bulldozer getting tweaked to not suck as much, and perhaps some new GPUs from NVIDIA and ATI/AMD – wouldn't that rock.

First up this month, though, is a bunch of reviews on quad-channel memory kits: we've

got four of them in the Labs that have each been tested against each other, with a bit of analysis thrown in to boot. Is quad-channel better than dual? Read on to find out!

We've also got a bunch of peripherals and a couple of cases to peruse, and for those who don't want to wait until new GPUs come out at an undisclosed time, there's a huge H2H. Yay!



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# HOW WE TEST

**W**e do a lot of testing in our labs, and we look long and hard at every piece of hardware to determine whether or not it passes muster. From taking a new card out of its packaging, to bundled extras, to performance, every facet of a given piece of kit's 'user experience' is under scrutiny.

In some instances, we have tough benchmarks to help us rate gear. For a CPU or a graphics card, raw performance is, of course, the most vital stat as whether it stinks or smells like roses, as well as the ability to overclock well. But there are other things we pay attention to in the review process.

Value for money is an important consideration, especially in the current financial climate. High end gear is expensive enough as it is, so we look for good bundles. For instance, a graphics card that comes with a game or two, all the cabling you'll need, and little surprises like tools and other bumpf will score higher than a card that costs similar, but doesn't give you any presents.

Build quality is another thing we rate. From a PC case to a motherboard, we like our hardware well-made and capable of a taking a bit of punishment. We also like any included manuals to be clear and concise.

A lot of what we look for can be hard to put into numbers, we admit, but we try to think about what any enthusiast would think about their new gear after laying down money for it, installing it, and then using it.

And our benchmarks help, too. We've picked a suite of games and applications that anyone can get access too, so that you – the reader – can easily compare your own gear with the kit we have in each issue. In fact, we'd recommend to all our readers that they run all of these tests on their systems and save the results, so you can always have a familiar benchmark of your own to compare to the latest gear in Atomic.



Our shiny Alienware-powered Gaming Lab, where we do most of our game reviewing and peripheral testing.





## CPU Benchmarks:

### Hexus PiFast

<http://pifast.hexus.net/pifast.php>

PiFast is a program that essentially calculates pi to a set amount of decimal places. It is a single-threaded application (one core/thread) and we run it at ten million places (10,000,000) using the Chudnovsky method, in the standard mode with no compression, and a FFT length of 1024kb. The program is free, so grab it and run it on your CPU. Memory bandwidth plays a significant role in the final performance of this program, so be sure you bump up the frequency as well as the CPU clock!

### wPrime

<http://www.wprime.net/>

"wPrime uses a recursive call of Newton's method for estimating functions", says the website as it attempts to explain in plain English what it does. What it does do is, essentially, complex square rooting and other number functions, which are able to be split up evenly between multiple cores, or simply run on a single core. We use wPrime 32M in both single and multi-threaded runs. The results of the single run are divided by the results of the multi run, and this gives us the efficiency of the CPU being tested – very useful knowledge to have when comparing chips and evaluating the benefits of overclocking.

### Cinebench R10 x64

[http://www.maxon.net/pages/download/cinebench\\_e.html](http://www.maxon.net/pages/download/cinebench_e.html)

Cinebench is a stalwart benchmark, and is one of the more entertaining ones to watch. It focuses on rendering an image at 800 x 600 resolution, complete with ray-traced light effects and much more. It can be run in either singlethreaded or multithreaded mode, and efficiency is calculated the same way as for wPrime. The program also supports up to 16 threads in total, and even eight threads with Nehalem is an impressive sight to see. The difference in performance between 32- and 64-bit is minimal – just keep that in mind if your results for the same setup are slightly different.

### Everest Ultimate Edition

<http://www.lavalys.com/>

Everest is a system information tool that monitors voltage, temperature, as well as reporting on a massive list of other areas of your system. Hardware and software are noted here, but perhaps the most useful part of this program is the memory benchmarks. Ready for the fastest of dual/tri-channel memory, this tests the read and write bandwidth as well as latency. The program is a small download, but keep in mind that you only get a thirty day trial until you purchase the full version – something recommended if you're into getting the most info about what your tech is up to.

## GPU Benchmarks:

### Crysis

<http://www.ea.com/crysis/>

Crysis is one of those games that can scale from Average Joe's rig all the way to the beastly Dream PC in Kitlog; but due to recent graphics card releases we needed to bump it up a notch. Our testing now uses a standardised timedemo run, with all settings on high at a resolution of 2560 x 1600. While we can't run any antialiasing at this res and still get playable framerates on most cards, it's still more than enough to really give cards the workout they truly deserve.

### Lost Planet 2

<http://www.lostplanet2game.com/>

Lost Planet 2 from CAPCOM may not have been a big seller, but its technology is a great implementation of DirectX 11 in version 2.0 of Capcom's existing MT-Framework game engine. It forms part of the atomic benchmarking suite due to its use of tessellation and other features in an actual game setting. Our tests use the freely available benchmark version of Lost Planet 2 and are run fullscreen at 1920 x 1200 with 8x antialiasing and 8x anisotropic filtering. Tessellation is set to Maximum and all the other settings cranked right up. Results are given in frames per second.

### Unigine Heaven 2.1

<http://unigine.com/products/heaven/>

A synthetic benchmark built specifically to harness the latest and most demanding features of DirectX 11, Heaven is one of the best ways to test a card's tessellation capabilities. With a built-in timed run around a fully realised world, this benchmark taxes cards significantly and puts them under serious stresses. We test at a resolution of 1920 x 1200 using 8x MSAA and 8x AF, completing two runs of the built-in benchmark. The first run is with tessellation set to 'extreme'; the other 'none'. This highlights how well the cards can handle DirectX11 features and what they'll be like in a game that doesn't use the effect.

### 3D Mark 11

<http://www.3dmark.com/3dmark11/>

It really wasn't that long ago that we were introducing readers to 3DMark Vantage, but the relentless pace of hardware creep has led to a whole new benchmark, 3DMark11. Designed to measure a PC's gaming performance this latest version makes extensive use of all the new features in DirectX 11 including tessellation, compute shaders and multi-threading. We test using the Extreme preset, which runs at 1920 x 1080(p); this is designed to push even high-end systems, so we feel it's indicative of exactly the loads Atomicians expect from their gaming rigs.



# ASUS Rampage IV Extreme

Drool...

Street Price \$530 Supplier ASUS

Website <http://www.asus.com.au/>

Specifications Socket 2011; X79 chipset; E-ATX form factor; 5 x PCI-e x16 (4 x 16x, 1 x 8x electrically); 1 x PCI-e 1x; 4 x SATA2, 4 x SATA3, 2 x eSATA3; DDR3-2400



To the delight of users, the motherboard arena has improved immensely over the past few years. Fear of memory incompatibility is a thing of the past, obscure crashes and failures are ultra rare, and we've come as far as having devices that can remain amazingly reliable well beyond design specifications. Mounting a large cylindrical pot on a CPU and filling it with LN2 isn't only expected in this day and age, but catered for. The area around a CPU is often left clear to ensure maximum accessibility, and there's features such as ASUS's 'LN2 mode' which combat the dreaded 'cold bug'.

With the Rampage IV Extreme, this focus on extreme users is made crystal clear. The motherboard features all the goodies you'd expect such as a debug display, quick access to power buttons, dual switchable BIOS's and voltage read points. ASUS could have easily left it there, and just rehashed the X58 based Rampage III Extreme for the new X79 platform. We got some new features to play with, namely OC Key, Subzero Sense and VGA Hotwire.

OC Key gives users the ability to monitor and tweak the motherboard by connecting a small device to a DVI port on your GPU. It sounds insane, but the justification is that it removes the need to waste CPU cycles during benchmarks. Heck, you can overclock the processor and/or GPU whilst the benchmark runs! You can see it in action here: <http://goo.gl/KNw4r>.

Subzero Sense is essentially two onboard thermometers to aid the monitoring of CPU and GPU cooling pots. Unfortunately the K-type thermocouple component required to take the readings isn't bundled with the board. Without them you can only read in the ambient temperature at the port itself. Interestingly, ASUS claim that the connector can measure

a temperature range from -200 to 1350°C with a sensitivity of 41  $\mu$ V/C.

Now we come to VGA Hotwire. This is probably the least novice friendly feature we've seen yet. It involves using a soldering iron to attach a 2-wire cable to the voltage points of your GPU. When connected to the motherboard, you can monitor the GPU voltages directly, and even make adjustments in real-time using the BIOS, OC Key or Turbo V interfaces. Friggin' insane, if you don't mind us saying so.

The Rampage IV offers a total of 8 DIMM slots for up to 64GB of quad-channel action. That's a lot of VMs! If you want to expand to a ridiculous GPU setup like quad-SLI or 4-way CrossfireX, this board has you covered. It's also ready for a PCI-e 3.0 compliant processor.

Available I/O ports and buttons include combo PS/2, 2 x 6Gb/s eSATA, LAN, 4 x USB 3.0, 8 x USB 2.0, S/PDIF out, 5 x audio jacks, clear CMOS, ROG Connect and Bluetooth switches. The bundle consists of standard kit, plus the OC Key and an X-Socket mount.

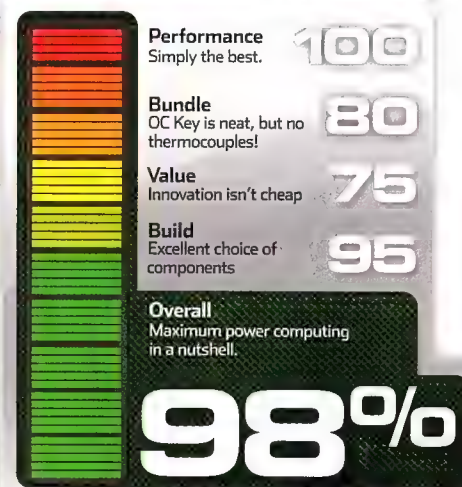
When it came to overclocking, we were blown away. The level of control provided by this board is overwhelming to say the least. We did chuckle at the various 'paradise' sections of the BIOS, for example, "CPU Tweak's Paradise". There's enough variables there to drive any tinkerer mad!

To overclock our 3960X, we opted to start at 'normal OC' optimized profile. We found that the 'Extreme OC' profiles were too aggressive for our particular chip. This set LLC to medium and increased the current limits by 10%. We pushed the voltage up to 1.5v and attempted to boot at 4.5GHz (approximately the clock rate we achieved on the G1.Assassin2). Prime95 was happy with that, and 4.6GHz, and even 4.7GHz! At this point we found that increasing the current limits and tweaking VTT voltage improved reliability of our benchmarks. An interesting phenomenon was occurring where one of the cores would do very little work (if any at all). No errors or crashing, just plain old refusal to function. We're not sure if this is a feature to maintain stability (we had turned off all power saving), or just an odd fluke, but adding an extra 0.01v appeared to fix it.

The only gripe we have is the price, but if you're willing to pay over a grand for the CPU alone, this probably doesn't concern you. If you're a professional overclocker or a multi-GPU fanatic, there's simply no better option at this time. **VC**

## ASUS Rampage IV Extreme

Test (Core i7 3960X @ 4.7GHz)	47 x 100; DDR3-1866 @ 9-10-9-24-2T	40 x 117.5; DDR3-2193 @ 10-11-10-28-2T	99 x 45; DDR3-2112 @ 10-11-10-24-2T
PiFast	15.66s	15.60s	16.44s
wPrime 32M - single thread	29.872s	29.747s	31.481s
wPrime 32M - multi-thread	5.115s (5.84x efficiency)	6.474s (4.6x)	6.678s (4.71x)
CineBench R10 64bit - single thread	7807	7822	7371
CineBench R10 64bit - multi-thread	38762 (4.96x efficiency)	37743 (4.83x)	31332 (4.25x)
AIDA Read	20506MB/s	21716MB/s	20662MB/s
AIDA Write	18123MB/s	18204MB/s	17234MB/s
AIDA Latency	47.9ns	43.8ns	45.7ns





# GEIL Evo Corsa GOC316GB2133C9AQC

Now in dehydrated urine colour!

Street Price TBA Supplier GEIL

Website <http://www.geil.com.tw/>

Specifications 4 x 4GB kit; PC3-17000 (2133MHz), 9-11-9-28; 1.65v; 240-pin DIMM; Non-ECC unbuffered DDR3

**G**EIL is a name we haven't heard from in a while. There must be something about X79 that has inspired them to inspect the playing field. We got our hands on their quad channel kit, the 2133MHz Evo Corsa running at relatively tight 9-11-9-28 latencies.

At this point in the tech scene, having ultra fast memory is typically a goal set by benchmarkers to squeeze out a slightly faster PiFast score. There are other benefits to having faster

memory, such as relieving bottleneck to an overclocked CPU, however 1600MHz is usually more than adequate.

We're not too sure about the colour chosen by GEIL. We can see this being a welcome addition to a funky fluoro-based theme, but otherwise, there aren't many components on the market that would match it. Also note that the tall fins of the modules may interfere with low-hanging CPU heatsinks.

When tested on the Rampage IV Extreme reviewed this month, we were delighted to see promising performance figures. With the Intel i7 3960X clocked at 4.7GHz, and the memory at stock settings, the Evo Corsa kit blitzed through our benchmarks. We then increased the clock rate from 2133MHz to 2309MHz, increased the voltage to 1.7v (up from 1.65v), and loosened the timings to 11-11-11-28 2T. This increased read and write transfer rate in AIDA64 by a nominal amount, but otherwise, it didn't have too much of an effect.

Although our overclock didn't yield much of an improvement over stock figures, it did manage to compete well with our reference G.Skill RipjawsZ modules.



We couldn't track down an Australian retailer that stocks the modules, so it's difficult to comment on the value. If they can be found at prices comparable, or even cheaper than the RipjawsZ sticks, then this is definitely a compelling buy. **VC**

Intel Core i7 3960X (HT off)	100 x 47; DDR3-2133 @ 9-11-9-28 2T	123.75 x 38; DDR3-2309 @ 11-11-11-28 2T
PiFast	15.58s	15.57s
wPrime 32M - multi-thread (HT off)	5.116s	5.117s
AIDA Read	21759MB/s	21978MB/s
AIDA Write	18120MB/s	18154MB/s
AIDA Latency	43.8ns	43.9ns



# Kingston HyperX KHX1600C9D3K4/16GX

Quad-channel on a budget.

Street Price TBA Supplier Kingston

Website <http://www.kingston.com/>

Specifications 4 x 4GB kit; PC3-12800 (1600MHz), 9-9-9-27; 1.65v; 240-pin DIMM; Non-ECC unbuffered DDR3

**A**tomic is all about maximum power components and their ability to be tweaked to within an inch of their wafer thin life. While many readers will look at budget components such as the Kingston HyperX kit and scoff, there's a strong market for value kits. Even in enthusiast circles, tracking down memory that does the job without costing a week's pay is

commonplace. It's a glorious achievement to find budget modules that overclock to the level of more expensive kits. Given the significant outlay of cash when purchasing a quad-channel capable system, one may be forgiven for opting for cheaper memory.

Kingston's HyperX modules attempt to fill the budget sector, though we don't have a local pricing on them yet. Each module is enclosed by a low profile heatsink with a blue metallic finish. They're compact enough to fit under larger CPU air coolers such as the Noctua NH-D14 without an issue.

Our tests showed that the performance of this kit isn't too shabby. PiFast and wPrime tests came close to the likes of the RipjawsZ and Evo Corsa kits. The main differentiators are latency and read transfer rate, where these modules don't fair quite as well. Given the 1600MHz rating, we're more than pleased at the result.

Overclocking didn't yield much of an improvement. The best we could manage was tightening the latencies to 8-9-8-24 1T. This helped with transfer rates and latency, but did nothing to help with benchmarks. Increasing the



voltage to 1.7v failed to provide extra headroom.

Despite the lack of overclock headroom, we're very pleased with the benchmark results. It goes to show that you don't need expensive memory to keep up with the best. If only we had a local price to compare with! **VC**

Intel Core i7 3960X (HT off)	100 x 47; DDR3-1600 @ 9-9-9-28 1T	100 x 47; DDR3-1600 @ 8-9-8-24 1T
PiFast	15.66s	15.68s
wPrime 32M - multi-thread (HT off)	5.116s	5.117s
AIDA Read	18466MB/s	18561MB/s
AIDA Write	18175MB/s	18156MB/s
AIDA Latency	50.4ns	49.5ns





# G Skill RipjawsZ F3-17000CL11Q-16GBZL

Apparently RipjawsZ was too obvious a choice.

Street Price \$175 Supplier G.Skill  
Website [www.gskill.com](http://www.gskill.com)

Specifications 4 x 4GB kit; PC3-17000 (2133MHz),  
11-11-11-30; 1.6v; 240-pin DIMM; Non-ECC

**G** Skill are well known for their Ripjaws range of memory. They have a reputation for being great value yet highly overclockable, and often ship with favourable latency values.

The RipjawsZ range are designed for use with the X79 platform, which means they come in kits of four modules to ensure quad-channel support. Physically, the main differences between RipjawsZ models are the colour of the heatspreader, and the inclusion of a clip-on air

cooler. Although this particular model doesn't include a fan module, we didn't have problems with the modules getting hot during testing. Provided your case has sufficient airflow we can't see extra fans doing much to improve overclockability.

Speaking of which, these sticks performed well in our benchmark suite. At a voltage of 1.7v, we were able to tighten the latencies to 9-10-9-24 2T at a clock rate of 1866MHz. This resulted in a slight boost in read and write speeds, making the modules comparable to the G.EIL Evo Corsa kit also reviewed.

Increasing the clock rate to 2193MHz whilst maintaining tighter than stock timings (10-11-10-28 2T) reduced latency significantly, and gave a strong boost to read speeds. The 32M wPrime test took a large hit, which in hindsight is probably due to one of the cores of the CPU playing up (as described in the Rampage IV Extreme review). We expect that had the core behaved, the WPrime result would be very similar to the 1866MHz test.

When compared with the G.EIL Evo Corsa kit,



the RipjawsZ perform ever so similarly across the board. It really comes down to whichever ends up cheaper once the Evo Corsa becomes available for purchase. **VC**

Intel Core i7 3960X (HT off)	47x100; DDR3-1866@ 9-10-9-24 2T	40x117.5; DDR-2193@ 10-11-10-28 2T
PiFast	15.66s	15.60s
wPrime 32M – multi-thread	5.115s (5.84x efficiency)	6.474s (4.6x efficiency)
AIDA Read	20506MB/s	21716MB/s
AIDA Write	18123MB/s	18204MB/s
AIDA Latency	47.9ns	43.8ns



# Corsair Vengeance K60 Keyboard

A fascinating and superbly engineered piece of gaming kit.

Street Price \$140 Supplier Altech  
Website [www.corsair.com](http://www.corsair.com)

Specifications Cherry MX Red mechanical switches;  
1000Hz/500Hz/250Hz/125Hz polling rate; sculpted FPS  
keys; multimedia keys; USB pass through.

**A**nticipation can be really dangerous. If you've been looking forward to something for long enough, there's always the chance that when it finally comes along it ends up just disappointing. Well, if you've been paying attention on our website, and our various previews and news stories on the site (just look 'em up), we have been looking forward to this like a boozier looks forward to his next Boilermaker. And...

We are not disappointed!

How amazing is that? This keyboard is pretty much exactly what we've been waiting for, and even though the changeover from my old standard MS gaming board is a harsh one, I can see the K60 scoring itself a permanent home in gaming cave (or ledge, more accurately - long story). So why?

Well, for one thing, this is one solid piece of kit thanks to the single piece of custom molded aluminium making up the main fascia. Though it has a standard plastic body underneath, the metal

frame means there's practically zero flex – this is great board for shoving in a bag and taking to a LAN. Or just hammering to within an inch of its life.

It goes without saying that the Cherry MX Red switches give the main keys (function keys use a traditional rubber dome) an incredible responsiveness and sense of tactile feedback. Even better, the wrist-rest opens up to reveal a second set of WASD and one-through-six keys, and a key-pulling tool; these keys feature surfaces that slope up and away from you, making it very easy to find them while focused on the screen.

In game, the 'board delivers. Playing a few rounds of Battlefield 3 – our Game du Jour in last issue's GotY poll – was a joy. The increased travel does take some getting used to, and wrist rest, while comfy, doesn't help the initial phase – we removed ours and immediately performed better. However, if you like rests, it'll be tops. The four adjustable legs underneath are really neat, meaning you can angle the keyboard up and flat,



toward you, or even away from you. The AV keys are all metal and feel beautifully machined, and a Gaming switch that disables the Windows key is icing on the tasty cake.

The M60 delivers. And for the MMO board that Corsair's released, and their mice and headsets, stay tuned in future issues. **DH**





# Rude Fierce 5000 v2

Only for the r00dest d00ds, yo.

**Street Price** \$49.95 **Supplier** Digital World Warehouse  
**Website** <http://tinyurl.com/Fierce5000>

**Specifications** 5000 DPI Laser Engine; 1000 Hz polling with 1 ms response time; onboard memory; 7x programmable buttons; teflon feet; customisation software.

We got a whole box of stuff recently from the same guys who distribute Cyber Snipa gear locally (including some new Cyber Snipa stuff), and in it was a gaming brand we had literally never heard of before – Rude Gameware. So, feeling like shedding some light on the newcomer, we took the Fierce 5000 v2 for a spin in a few rounds of Battlefield 3 (winner of Atomic's Game of the Year 2011, so now our standard testing platform for PC gaming).

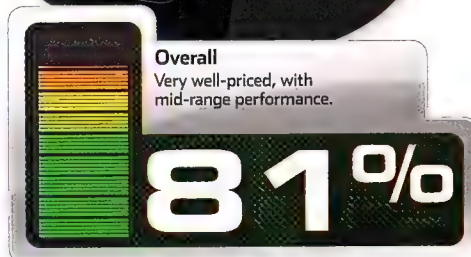
It's an odd little beastly. It feels very comfortable under the hand, thanks to a high-arched design and deeply indented sides coated with a film of rubber for ease of grip. It's symmetrical, too, which will please cack-handers, but what's really interesting is it doesn't feel uncomfortable when you hold it. Button positioning is solid, with two thumb buttons on the side, two more buttons near your index finger (if you're a righty), and the two main buttons formed from the same single

piece that makes up the entire upper surface.

The mousewheel is particularly good, being solid metal with a definite click, but nonetheless capable of being spun freely with a little force. The package is completed by a long, cloth-wrapped cable that should suit most gaming setups. There are weights for getting the whole thing to feel just right, and there's an impressive heft once all are slotted in.

In-game satisfaction is where it really matters most, and the 5000dpi sensor is certainly responsive. The Fierce doesn't wobble all over the place if you're a mouse-picker-upper, and there's certainly nothing to dislike. We did feel like performance was reduced a little overall, though; we normally game with a SteelSeries Sensei, and despite the Fierce's competitive price, it just doesn't stack up in raw feedback and comfort.

We love the teflon feet, though – they are super smooth. The Fierce 5000 v2 is a good option if you want a lower-end mouse on a budget, and it certainly is comfortable. **DH**



# CM Storm Sirius 5.1 headphones

May in fact be lead-lined.

**Street Price** \$120 **Supplier** CoolerMaster  
**Website** <http://tinyurl.com/CM-Y-So-Sirius>

**Specifications** Headphones: True 5.1 surround sound; Driver: F/R/C: 30mm Sub: 40mm; Impedance: F/R/C: 32 Ohms Sub: 16 Ohms; Transducer principle: Dynamic closed; Ear coupling: Circumaural; Detachable micro fiber cushions; Sensitivity: >105dB; Frequency Response: 10Hz – 20,000Hz

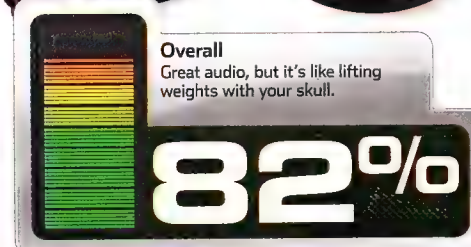
The first thing we thought when we hauled the Sirius headphones out of their rather large box was "Wow, that's a lot of cable". The second, more telling thing was, "Wow, that's one heavy set of cans." These are gaming headphones taken to design and aesthetic extremes, and whether or not they work for you is going to be determined not by build quality or sound reproduction, but how strong your neck muscles are.

A lot of the weight in the Sirius package comes from the 'tactical mixing control', which is an admittedly very well-made chunk of kit. It sits in between the headphones and your PC, cabled to both, and controls not only sound levels, but also individual volume on rear, front, and center outputs, as well as bass. You can also mute from here, and it's very easy to use; the heaviness comes from a reinforced base and very solid volume knob, making up for an overall package

that is robust and immobile, even as you blindly swing your head around in the middle of a heated gaming session.

The headphones, as we've elucidated, are very heavy. The problem lies in the chunky design required to fit in the cabling for the backlit logo and mic; glowing gaming gear is nothing new, but having something lit up that you are never going to see seems questionable at best (unless you're creepy, and routinely video yourself while gaming – but then you've got other problems), but the weight issue tips it right over into overkill. After an half hour with these 'phones we developed a sore, stuffed neck, and a spine that made a sound not unlike popping corn.

It's a shame, because the 5.1 sound reproduction is very good. It's never going to compete with real external speakers, but it does deliver great bass notes and crisp high end crackle – perfect for FPS games; Battlefield 3 sounds marvelous with the Sirius. The padded earcups (there's cloth and vinyl options included) are comfortable, and despite the weight they never feel like they're going to fall off. Once you've got the sound levels of all the outputs tweaked these are great sounding 'phones... but you'll get more comfort and better quality from Plantronic's Gamecom range. **DH**





# Avermedia Game Capture HD

Quick! To the YouTubes!

**Street Price** \$200 **Supplier** Avermedia  
**Website** [www.avermedia.com](http://www.avermedia.com)

**Specifications** 720p/1080i recording; component cable for Xbox 360, PlayStation3 and Wii; 2.5in internal bay; USB slot; remote control

One of the single best things that can happen when reviewing a product is realising that it just works. No mucking about, no deciphering manuals, no trawling the interwebs. There are embedded options to twiddle with, but the process from opening the box to using the product is as quick and seamless as possible.

Avermedia has done this wonderfully with the Game Capture HD. This standalone box is designed to sit between a console and HDTV, and allows you to record gameplay with the push of a button. While this sounds simple, we have tried to capture enough console footage over the years at Atomic to know that it never is.

This is why the Game Capture HD excites us so much. While it is very much a solution to first world problems, it makes capturing and subsequently watching or uploading gameplay footage a breeze. It uses component video outputs to do this, avoiding issues thrown up

by the inclusion of HDCP in the HDMI specification. To set the box up, just use the included Xbox 360/PS3/Wii to component output cable, and then plug the box into the component inputs on your TV.

You can capture footage to a USB hard drive, or you can install a 2.5in internal drive. Then all you need to do while gaming is hit record on the remote and everything is scribed down as an AVI with MP3 audio in the output resolution of your console – the box supports recording up to 720p/1080i. There are more advanced settings to use, but you don't need to bother if you don't want.

The big concern when piping graphics through a passthrough box like this is latency, and this is an area where Avermedia impresses. While there is some lag, it is barely perceptible, and we didn't find it impacting gameplay.

Not only has Avermedia delivered a product that works quickly and easily, but it has done so with attention to detail and a focus on what people actually want. While it may seem extravagant to spend \$200 on a box designed



to record video games, for those who share footage or show off leet skills on the Youtubes, then this is a truly fantastic bit of kit. **JG**



**Overall**

A simple and elegant way to capture game footage.

**95%**

# Turtle Beach Ear Force Z6A

Like strapping two extremely vocal turtles to your skull.

**Street Price** \$139.95 **Supplier** Turtle Beach  
**Website** <http://tinyurl.com/TB-EF-Z6A>

**Specifications** Headphones: True 5.1 surround sound; Driver: F/R/C: 30mm; Sub: 40mm; quick disconnect in-line amplifier; Closed design; Detachable micro fiber cushions; Sensitivity: >120dB SPL; Frequency Response: 20Hz – 20,000Hz

There's a big reason that sound appears in our game reviews – because just like film, good sound helps the gameplay experience. Whether you're sneaking through a draught-filled cairn and listening for necromancers, or screaming orders to team mates over the noise of a chopper drop, a good set of headphones can make all the difference.

The Turtle Beach Ear Force Z6A are a little unusual for being PC specific, rather than the more common practice of producing console cans that can also slot into a USB port. The company has worked hard to create a quality product that any PC gamer would be extremely happy with. The construction feels solid, and at 380g for the headset, it's light enough to wear for extended sessions without any discomfort.

The Z6A ships with a headset amplifier that lets you control four channels (central, surround, sub-woofer and front) individually, along with

master volume and mic. It's worth noting that to get this level of control, the headset requires five different connections to your PC (three audio jacks, one mic, and USB power to the amp) – this isn't a simple set of headphones. The amp connects to the cans via a surprisingly short cable, at roughly 50 centimetres, which might be an irritation for some.

It's all worth it though, because the sound quality that's produced by the Z6A is amazing. The directionality is easily conveyed by the surround setup, and the fine control produced by the amp means you can adjust for different games. The bass felt solid, but never overwhelming, even with explosion-heavy games.

In another excellent touch the headset ships with a cable splitter, meaning you can have the Z6A connected to your PC at the same time as a quality 5.1 speaker set up. For people who want to use their 5.1 speakers for music and even the odd film, but still strap on some 'phones for some immersive gaming, the Z6A is perfect.

This quality doesn't exactly come cheap, but at \$140 RRP the Turtle Beach Z6A is not a bank breaker and is a solid investment for the serious PC gamer. **NH**



**Overall**

Surround sound worth its weight in unobtainium.

**96%**





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PC DIY	08 8410 0446



# Fractal Design Core 3000

Black and white (no red) all over.

**Street Price** \$110 **Supplier** Anyware  
**Website** <http://tinyurl.com/Core3000>

**Specifications** 200 x 430 x 480mm, 7.1kg; 7x expansion slots; 2x 5.25in drive bays, 6x 3.5/2.5in drive bays; 1x 140mm fan (front), 1x 140mm fan (top), 1x 120, fan (rear); 4x USB2, 1x audio; up to ATX; steel and plastic construction.

**T**here's a lot of competition throughout the case market, but arguably it's most fierce at the lower to mid-range of end of the market. It seems that the cheaper you want your case to be, the harder it is to differentiate your product, which makes sense when you think about it. The serious, most premium features are expensive, so therefore better suited to more expensive cases; at the lower end we commonly see case-makers resorting to odd designs and decidedly gimmicky features to steal a march on their competitors.

Fractal Design doesn't work like that.

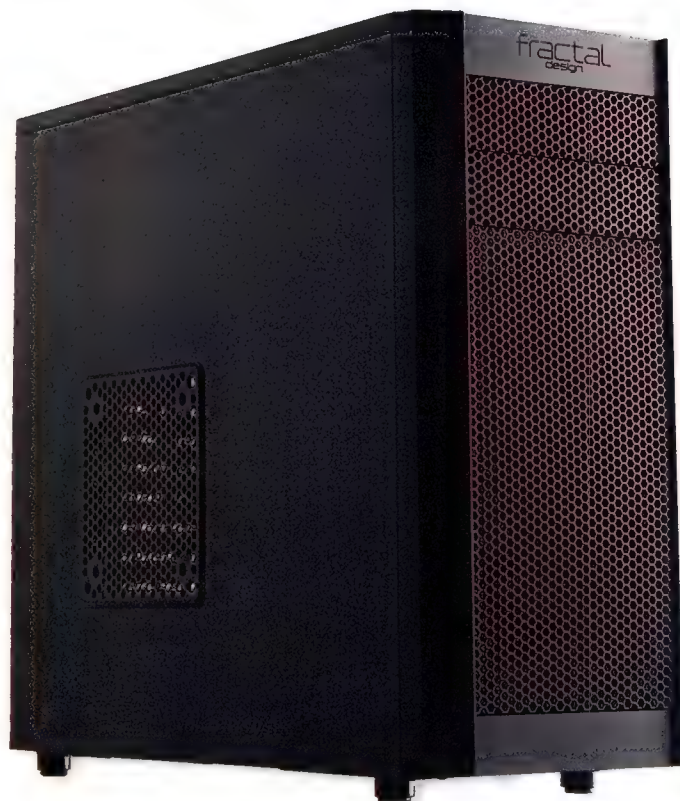
The Core 3000 case is only a touch over \$100, and may well be at that mark or lower by the time you're reading this. And though it is very much on the small size, it's still a solid choice for a mid-range ATX system if you're not looking to pack it out with a video card the size of a small country.

Externally it's pretty plain. You've got a hexagonal mesh on the front fascia, similar mesh covering two fan mounts on the upper panel, and more mesh covering a 120/140mm mount on the side. The IO ports are on top edge, and, again, are pretty plain – four USB2 ports and standard audio, with the addition of a fan controller making things a little more interesting. The rear panel shows a little more flair, with white expansion brackets and the white blades of the rear exhaust fan breaking up the forbidding

black expanse.

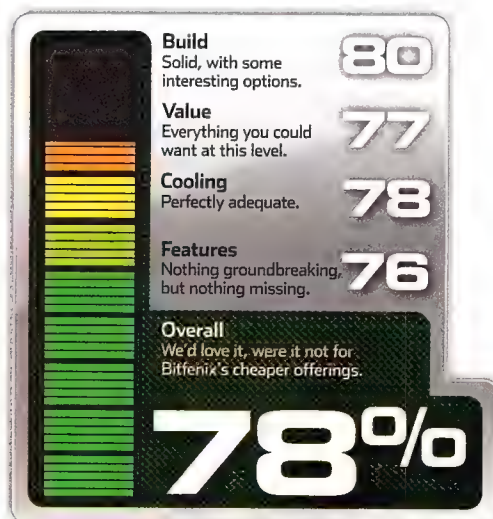
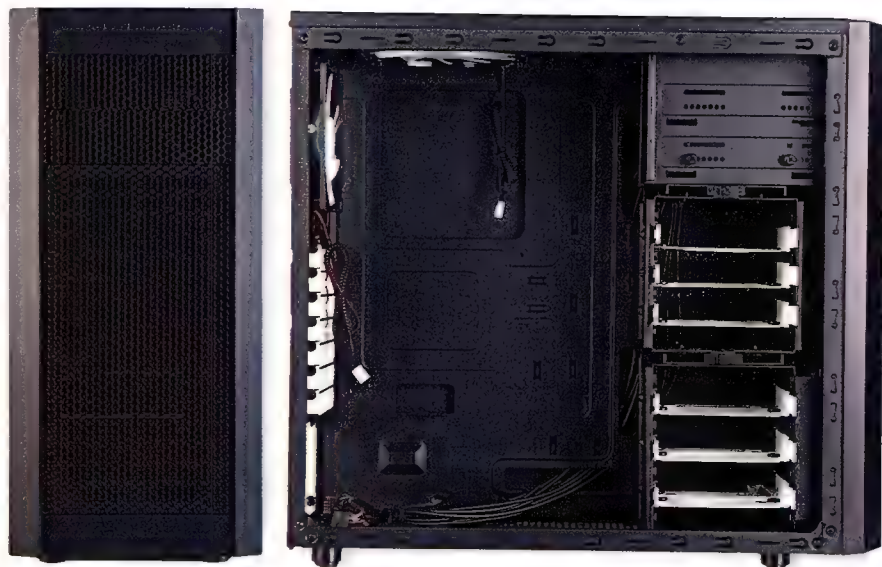
The white highlight theme continues inside the case as well. While the bulk of the interior is solid black, the HDD caddies are white. It's a bold look. Aesthetics aside, the case is a good example of making a cheaper (not cheap) case without cutting corners. There's a generous cutout in the mobo tray, and some room behind the tray for cable management. It's not overly generous, and the lack of multiple cutouts for those cables is bit of an oversight, but it's something. Every edge is well finished, too, meaning that cut fingers should be easily avoided (unless you've got paper-thin skin, in which case... we got nothin').

Being on the smaller size of a tower design, you're not going to fit a giant video card in here at stock, as we've alluded, but if you really must, the Core 3000 can handle most. The HDD caddies are not only full metal models, which we approve of (this certainly beats the plastic caddies that a lot of even higher end cases rely on), but the upper HDD cage is removable. With that out of the way, you've got a mess of room to up-gun the graphics of whatever system you build into this case. But you'll probably want to



be very careful about the cooling, as the clearance on the CPU is only 160mm. You have been warned. Similarly, the PSU mount is a little tight if you want to add a fan to the bottom mount.

Regardless, this is a great blank slate of a case, and for the price it delivers pretty much everything you could want for a basic build. You can get the Shinobi for less from Bitfenix, but if you want just a touch more black and white class, this might be for you. **DH**





# Corsair Carbide 500R

Corsair hits it out of the park – again – with this great mid-tower case.



**Street Price** \$160 **Supplier** Altech  
**Website** <http://tinyurl.com/Carbide500R>

**Specifications** 520 x 205 x 508mm; 8x expansion slots; 4x 5.25in drive bays, 6x 3.5/2.5in drive bays; 1x 200mm fan (side), 2x 120mm fans (front), 1x 120mm fan (rear); 2x USB3, 1x 1394, 1x audio; ATX, mATX; steel and ABS plastic construction.

**W**hite is very much the new black, it seems. Corsair's leading the snowy charge, but we've also got a Level 10 case this issue that's similarly bright and glaring. We kinda like it as a change, but if you take a look at any of your white goods at home – fridges, washers and the like – you'll likely notice that it doesn't take much use to earn a patina of wear marks and stains. If you use your computer far more than you use your drier (which is more a statement of your computing addiction than an indication of your cleanliness), it's fair to say that a white PC will need a bit of love and attention to keep it looking clean. There is a black version, but the one we have on review is the mighty whitey iteration.

However, that's a tiny complaint – positively churlish, really – compared to the rest of the design-brilliance that makes up the Corsair Carbide 500R.

Externally, beyond the stark black and white colour (or lack thereof) scheme, the case's lines are simple and elegant. The front fascia is black mesh over two 120mm fans, with controls and IO ports sitting below the top edge. The power and reset buttons are sturdy, with a short travel to a definite actuation point; one of the usual indicators of good case quality in the rest of the build. There are also two USB3 headers, and a

lighting control switch to stealth your rig when you don't want to be blinded by the fan lights.

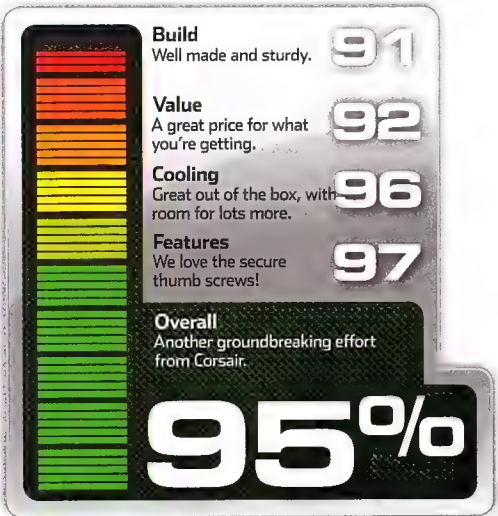
The upper surface features an easily removable black mesh panel, with two empty fan mounts beneath (and room for a 240mm radiator if you go the liquid route), and the side panel boasts a 200mm fan to really cool hot-running components. With another fan mounted on the rear panel, this is a very good case for airflow. Even better, every mount features rubber grommets to cut down on vibration and noise.

We were initially sure there was something wrong with the thumb screws that secure the panels, because they seemed 'stuck' at first. However, on closer inspection, we noticed the screws were designed in such a way that once unscrewed from the case proper, they still hung on the sidepanel – brilliant! If you're a frequent upgrader, you'll know that thumbscrews are pretty easy to lose (although a handy tool tray on the case's upper surface would help with this), but this solution means you'll never misplace them. It's rare to see something entirely new (well, not new, per se) in case design, but Corsair has managed to surprise us with this one; very few other manufacturers make the trouble to include these kinds of screws.



Internally, the case is just as smooth. Everything's black inside, with lots of rubber-grommets cable runs and room enough behind the mobo tray to make them useful. The ODD bays are secured with a simple tool-less option, while the HDD caddies (which secure drives with rubber grommets screws) simply clip in and out.

Corsair really seem incapable of making a bad product at the moment, and for the price this case is a great option for the mid-range builder looking to make a bold statement with their next rig. **DH**











# GTX 560 Ti: TMI

Antony Leather loves the GTX 560 Ti 1GB. He loves it so much that we've grabbed four of them to see which one comes out on top. Get ready to know this card intimately.

**W**e were impressed when the GTX 560 Ti 1GB arrived last January. NVIDIA had built on the foundations of the GTX 460 1GB, unlocking an extra SM to raise the stream processor count to 384. Its low-leakage transistors also allowed the GPU to run cooler and at higher frequencies. The result was a great mid-range GPU that could play modern games at maximum settings even at 1920 x 1080 with 4x AA. It's also a stupendous overclocker, with some GPUs reaching 950MHz.

Since its release we've seen some great versions of the GTX 560 Ti 1GB with a huge range of custom coolers, power circuitry designs and factory overclocks. However, as summer sets in and gamers settle down to play top games such as Battlefield 3, there are plenty of new models being released. We've four contenders, seeing if having 2GB of GDDR5 actually does anything for you, and tested them all to determine which GTX 560 Ti should reside at the top of your shopping list.



## Zotac GeForce GTX 560 Ti 1GB

A jack of all trades but master of none.



**Street Price** \$330

**Website** <http://tinyurl.com/Zotac-560Ti>

**Specifications** 822MHz core; 1000MHz memory (4000MHz effective); 384 'GF114' CUDA cores; 1024MB GDDR5; 256-bit bus width; dual slot active cooling, 190mm long; 2x 6-pin PCI-e power connections

We like Zotac's choice of colours for its GTX 500-series graphics cards. The Zotac GeForce GTX 560 Ti 1GB certainly looks like a gaming part, even if it is a little bumblebee-esque.

The heatsink looks very similar to the NVIDIA reference cooler, with two 6mm heatpipes protruding out of one side and a single 75mm fan providing the cooling. The Zotac is shipped at stock speeds; this is a bitter pill to swallow given that others have substantial overlocks applied as standard. Thanks to its relatively compact shape, however, the Zotac takes up only two expansion slots and is noticeably shorter than the MSI card.

At stock speeds the Zotac recorded a minimum frame rate of 32fps in Bad Company 2 at 1920 x 1080 with 4x AA – the same result as the slightly cheaper Gainward Phantom, although the latter managed a slighter higher

average frame rate thanks to its additional 1GB of memory chips.

In Arma II at the same settings however, the extra memory provided no such advantage; the Zotac matched the performance of the Gainward, with a minimum frame rate of 35fps and average frame rate of 44fps.

The Zotac's GPU wouldn't overclock above 920MHz without any additional voltage, but the memory was happy running at an effective 4.5GHz – the third fastest on test. With a 60mV increase to the GPU using MSI Afterburner, we coaxed the GPU up to 930MHz – the joint slowest speed on test. Even so, this overclock boosted the minimum frame rates in Bad Company 2 and Arma II by 31 per cent and 11 per cent respectively. Noise levels were nothing to write home about – the Zotac isn't as loud as the monstrous MSI, but it's noticeably noisier than either of Gainward's cards.

The Zotac doesn't make for a particularly appealing purchase, although it's far from a terrible graphics card. A 110MHz overclock with a modest voltage increase isn't bad, nor is it especially noisy. It doesn't take up three expansion slots like Gainward's Phantom, and kept the temperatures in check. However, the Gainward Golden Sample is much cheaper, faster and far quieter. Its only saving grace is a 2-year warranty, matched by the competition.

**Overall**

It's very expensive for what you get.


**58%**




# MSI N560GTX-Ti Twin Frozr II/OC

A noisy cooler casts a cloud on our previous favourite.



 Huge overclocking potential; effective cooler; decent price

 Cooler is very noisy under load; card is very long

**Street Price** \$270

**Website** <http://tinyurl.com/MSI-560Ti>

**Specifications** 880MHz core; 1050MHz memory (4200MHz effective); 384 'GF114' CUDA cores; 1024MB GDDR5; 256-bit bus width; dual slot active cooling, 237mm long; 2x 6-pin PCI-e power connections

We first heard of MSI's N560GTX-Ti Twin Frozr II/OC eight months ago, when it claimed to be the best GTX 560 Ti 1GB. Unfortunately, MSI has since changed the card's cooling profile, despite retaining the same name, so we were curious to see if anything else had changed.

The card is still huge – at 237mm, it dwarfs the Gainward Golden Sample by nearly 50mm thanks to its 7+1-phase power delivery. The cooler is equipped with two 6mm and two 8mm heatpipes, while two recessed 80mm fans blow air down over the heatsink and over the PCB and memory chips. The first revision of the card had a very quiet cooler, but it circulated a fair amount of heat back into your case, as seems to be the norm with many third-party coolers these days.

The two 6-pin PCI-E power connectors are situated at the end of the PCB. This is more pleasing to the eye than side-mounted

connectors, although given the length of the card, it isn't a great option if you have a small case – Gainward's cards are your best bet in this respect.

Boasting a GPU frequency of 880MHz and effective memory frequency of 4.2GHz, the Twin Frozr II/OC was considerably faster than the stock speed cards on test here. This was most obvious in *Bad Company 2* at 1920 x 1080, where it managed a minimum frame rate that was 16 per cent faster than the Gainward Phantom's. *Arma II* didn't see much improvement, but at the same settings, *Black Ops* and *Dirt 2* were 9 and 6 per cent faster respectively.

The Twin Frozr II/OC reached a GPU frequency of 975MHz at stock voltage, and 1020MHz after increasing the GPU voltage in MSI's Afterburner software by 60mV. This saw its minimum frame rate in *Bad Company 2* at 1920 x 1080 increase by 12fps – only Gainward's Golden Sample came close, thanks

to its 5GHz effective memory frequency when overclocked. Sadly, because of the aforementioned change to the fan's cooling profile, it's now unpleasantly loud under heavy load. However, it managed the best load delta T on test: just 37°C.

It was much louder than any of the other cards we tested. As such, despite being an overclocking monster, we can't recommend buying the N560GTX-Ti Twin Frozr II/OC, as it's very loud and will cause headaches fitting into some cases.





# How to Overclock NVIDIA Graphics Cards

Applicable to all NVIDIA cards, we look at how to overclock a GTX 560 Ti.

The GTX 560 Ti can play many games at its stock speed, but it's also a great overclocker, as you can easily add 100MHz or more to the GPU frequency. The memory and stream processor clock speeds are also very tweakable, and you can even increase the voltage a little too.

Our preferred overclocking program for NVIDIA graphics cards is MSI Afterburner (based on Rivatuner). It provides a real-time output of clock speeds, GPU voltage, fan speed, GPU temperature and even GPU usage. You can download it for free from [www.msi.com](http://www.msi.com). To check that your overclock has been applied, it's also worth going to [www.techpowerup.com/gpuz](http://www.techpowerup.com/gpuz) and downloading GPU-Z – a graphics card monitoring program.

Finally, you'll need a copy of the Unigine Heaven benchmark that you can find at <http://unigine.com> – this is also a free download. This will stress-test your graphics card during overclocking to make sure that it's absolutely stable.

## [Step One] Install

### Afterburner

Start by familiarising yourself with MSI Afterburner. Check your graphics card's GPU temperature – if it rises above 85°C at any point then you need to dial the overclock back a little, as this is very toasty. It doesn't matter whether you have a 1GB or 2GB version of the GTX 560 Ti – this guide will work the same with both versions. Start by raising the GPU core frequency to 900MHz. We've yet to see a GTX 560 Ti that can't hit 900MHz with its eyes closed. The Shader Clock frequency will alter automatically when you adjust the GPU core frequency, so just change the core freq.

## [Step Two] Stress Test

It's always best to check for stability issues after every overclock, so your next task is to run Unigine Heaven. Leave it running for at least five minutes – this is usually enough to highlight any overclocking-induced glitches.

## [Step Three] Continue Tweaking

Quit Heaven and head back to Afterburner. Check the maximum recorded GPU temperature and if it's acceptable (i.e. under 85 degrees), you can continue tweaking. Now



increase the memory frequency to 2,100MHz – this is equivalent to a 4.2GHz effective frequency, which is 200MHz faster than a stock-speed GTX 560 Ti. Most cards will do this fine, though some have dodgy memory chips that can't be pushed – if this is the case only improve core frequency.

## [Step Four] Burn-In

With the new memory clock applied, run Heaven again. You should complete this cycle until you



begin to see graphical corruption that usually appears as flashes of incorrect colour or black lines. These should be obvious if you've seen the benchmark run a few times. When you run into these graphical glitches, reduce the clock speeds to stable levels. It's also worth playing a few demanding games to make sure that your graphics card is stable.

For a test of stability we recommend running Furmark [www.ozon3d.net/benchmarks/fur/](http://www.ozon3d.net/benchmarks/fur/) (or Unigine at high settings) alongside OCCT [www.ocbase.com/perestroika\\_en/](http://www.ocbase.com/perestroika_en/) for over an hour – if your system is still standing after that it's likely to keep powering on through anything you throw at it.



# Gainward GeForce GTX 560 Ti 2048MB Phantom

Quiet as a mouse. The grain-eating kind.



Extremely quiet;  
fairly overclockable;  
very cool-running;  
short PCB



Triple-slot cooler;  
extra memory  
doesn't yield much  
extra performance

**Street Price** \$300

**Website** <http://tinyurl.com/Gain-560Ti-Phant>

**Specifications** 822MHz core; 1002MHz memory (4008MHz effective); 384 'GF114' CUDA cores; 2048MB GDDR5; 256-bit bus width; triple slot active cooling, 188mm long; 2x 6-pin PCI-e power connections

The Gainward GeForce GTX 560 Ti 2048MB Phantom's cooler looks positively cute compared with the more expensive GTX 570 1.3GB version by the same manufacturer. However, Gainward has also increased the memory of this Phantom to 2GB of GDDR5. The GTX 560 Ti 1GB is a mid-range GPU, usually at home at resolutions of 1920 x 1080 and below in demanding games, so we were keen to see if the extra memory provided any extra performance.

The Phantom was the second-most expensive GTX 560 Ti 1GB card on test, but is decently priced for a better cooler and more memory. The custom cooler has two 80mm fans, which blow air directly onto the PCB, memory and VRMs, drawing it first through a large, flat heatsink. This is fed by four 6mm heatpipes. The PCB is just 190mm long and ideal for a small case, but the cooler extends

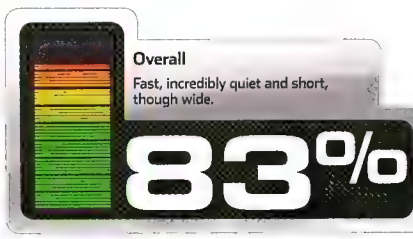
into a third expansion slot.

The Phantom only ships at stock frequencies too, making the higher price seem a bit steeper. Inevitably, the Phantom posted similar results to other stock-speed cards on test. It managed comfortably playable minimum frame rates of 35fps and 32fps in Arma II and Bad Company 2 respectively at 1920 x 1080 with 4x AA. In contrast, the Gainward Golden Sample, which is pre-overclocked but has the standard 1GB of memory, was 15 per cent faster at the same Bad Company 2 settings. However, the Phantom was 2fps faster than the identically-clocked Zotac, which has only 1GB of RAM. The Phantom managed 12,058ppd while folding and the cooler did a superb job under load, with the GPU reaching a low delta T of 40°C.

After pushing the Phantom to just 925MHz using Gainward's XperTool overclocking software, we tried MSI's Afterburner suite and unlocked the voltage adjustments. Raising the voltage by 60mV netted 930MHz – the second

lowest frequency on test, with the memory running at an effective 4.3GHz. This saw a 12fps boost in Bad Company 2, where the 2GB again saw it move ahead of the identically-overclocked Zotac.

The Gainward GTX 560 Ti 2GB Phantom is the quietest GTX 560 Ti we've heard, and it didn't fare too badly in the speed stakes once overclocked, although we're not convinced that the extra memory yields much extra performance. If noise is your priority, however, the Phantom is a great buy.





# Gainward GeForce GTX 560 Ti 1024MB Golden Sample

She's golden, mate!

Street Price \$275

Website <http://tinyurl.com/Gain-560Ti-G>

**Specifications** 900MHz core; 1050MHz memory (4200MHz effective); 384 "GF114" CUDA cores; 1024MB GDDR5; 256-bit bus width; dual slot active cooling, 188mm long; 2x 6-pin PCI-e power connections

As part of Gainward's 'Golden Sample' range, this version of the GTX 560 Ti comes factory overclocked with the GPU set to 900MHz, the stream processors to 1.8GHz, and the memory at an effective 4.2GHz. The latter boosts the memory bandwidth from 128GB/sec to 134GB/sec over a stock GTX 560 Ti 1GB, which should yield more performance, particularly at high resolutions or with large amounts of anti-aliasing enabled.

The cooler is different to that of Gainward's other offering in this Head2Head, the Gainward Phantom. The latter sports two 80mm fans, a triple-slot cooler and an extra 1GB of memory, whereas the Golden Sample is equipped with a dual-slot cooler, and relies on two larger 92mm fans to direct air through less heatsink. Under this is a 5-phase power circuit that uses fairly standard solid chokes.

As with the Phantom, the Golden Sample is very compact, at less than 200mm long. The card sports two DVI and a D-Sub, as well as an HDMI output. The two 6-pin PCI-E side-mounted power connectors means that squeezing it into shallow cases is a simple job, although keeping the power cables tidy will be harder than if the sockets were hidden away at the end of the PCB. The edges of the card are almost entirely

**We increased the memory to an effective frequency of 5GHz – that's 500MHz faster than any of the other cards on test**



open, meaning that a lot of warm air will spill back into your case. While this isn't ideal, it's the norm with many third-party coolers. As long as your case has good airflow, this should pose few issues.

## Factory-overclocked performance

At 1680 x 1050 with 4x AA, the pre-overclock was evident in all our test games except Arma II, where the Golden Sample was just 1fps faster than a stock GTX 560 Ti – 43fps compared to 42fps. In Bad Company 2 however, the Golden Sample's minimum frame rate was 6fps faster than those of the stock speed cards on test. At the same settings, the minimum frame rate was 7fps and 8fps faster in Dirt 2 and Black Ops respectively. These are sizable benefits, but not a great advantage at this resolution.

Arma II didn't run any faster at 1920 x 1080 with 4x AA but again, Bad Company 2's minimum frame rate saw a substantial 6fps improvement over the stock-speed cards – 38fps compared to 32fps. The Golden Sample also had an 8fps advantage in Black Ops, while Dirt 2 ran 5fps faster than the stock cards. This also suggests it will perform better in Battlefield 3, which uses the same engine as BC2.

The Golden Sample had almost a 1,000ppd advantage when folding, producing 13,040ppd compared to



the 12,058ppd achieved by the stock-speed cards. However, it drew 12W more from the wall to achieve this – 264W in total. It was also the most power-hungry card when gaming, drawing 30W more than the Zotac.


The cooler proved to be relatively effective, although the MSI was far cooler. The Phantom also posted a delta T well below that of the Golden Sample, but it isn't an overclocked card, meaning that it has to deal with less heat as a result. However, although the Golden Sample wasn't quite as discreet as its sibling, the Phantom, it's still one of the quietest GTX 560 Ti 1GBs we've heard.


## Pushing it further

Gainward's own overclocking software, XperTool, is quite limited for thorough overclocking of these cards; we opted to use MSI's awesome





 Compact; overclockable; fairly quiet; costs only \$275

 Not as quiet as the Phantom



Afterburner software to overclock the Golden Sample. Sadly, without adjusting the voltage we hit a wall at 915MHz on the GPU frequency, above which we began to see corruption and artefacts in our stress tests.

However, this disappointment was eased by an absolutely stonking memory overclock. We were quickly able to increase the memory to an effective frequency of 5GHz – that's 500MHz faster than any of the other cards on test. Adding 60mV to the GPU allowed us to push the GPU frequency even higher, to a much healthier 940MHz.

While this GPU overclock isn't as high as that of the MSI, at these frequencies the Golden Sample still managed a minimum frame rate that's 8fps faster than its out-of-the-box speeds in *Bad Company 2* at 1920 x 1080 with 4x AA, claiming second place in the process. The story

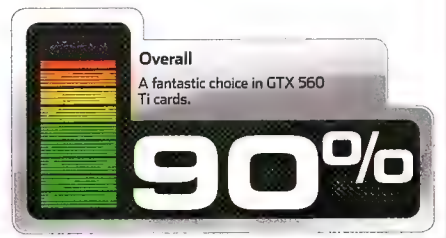
was similar in *Arma II*, with the Golden Sample adding another 6fps to its minimum frame rate at the same settings, again claiming second place behind the MSI.

## Polished to a shine

Gainward's engineers have clearly spent some productive time in the company's R&D department, as many of the recent graphics cards that Gainward has thrown our way have been excellent. The Phantom range of cards have proven themselves to be extremely quiet and good value for money. The Golden Sample certainly produces the goods. It's reasonably quiet, very overclockable, sports a hefty overclock out of the box and is very compact, making it the perfect choice for a small but powerful gaming system. It's also an ideal upgrade to get you ready for the onslaught of

highly awaited games due out this winter.

It's a shame that the MSI N560GTX-Ti Twin Frozr II/OC 1GB is so noisy, but the Gainward GeForce GTX 560 Ti Golden Sample is a very worthy choice for top spot. If you're after the quietest possible machine, the Gainward GeForce GTX 560 Ti 2048MB Phantom may be a better choice, but for all other situations, the Golden Sample is a fantastic graphics card.



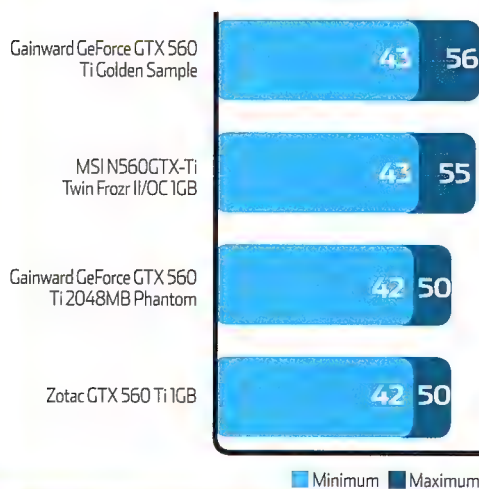


## Specifications table

	Gainward GeForce GTX 560 Ti Golden Sample	Gainward GeForce GTX 560 Ti 2048MB Phantom	MSI N560GTX-Ti Twin Frozr II/OC 1GB	Zotac GTX 560 Ti 1GB
Price	275	300	270	330
Product Page	<a href="http://tinyurl.com/Gain-560Ti-G">http://tinyurl.com/Gain-560Ti-G</a>	<a href="http://tinyurl.com/Gain-560Ti-Phant">http://tinyurl.com/Gain-560Ti-Phant</a>	<a href="http://tinyurl.com/MSI-560Ti">http://tinyurl.com/MSI-560Ti</a>	<a href="http://tinyurl.com/Zotac-560Ti">http://tinyurl.com/Zotac-560Ti</a>
GPU				
GPU Frequency	900MHz	820MHz	880MHz	820MHz
Stream processor frequency	1,800MHz	1,640MHz	1,760MHz	1,640MHz
Memory				
Amount (type)	1GB (GDDR5)	2GB (GDDR5)	1GB (GDDR5)	1GB (GDDR5)
Effective frequency	4.2GHz	4GHz	4.2GHz	4GHz
Card specifications				
PCI-E Power connectors / location	2 x 6-pin / side	2 x 6-pin / side	2 x 6-pin / end	2 x 6-pin / side
Ports	2 x DVI, HDMI, D-Sub	2 x DVI, HDMI, D-Sub	2 x DVI, mini-HDMI	2 x DVI, HDMI, DisplayPort
Slots, length	Dual, 190mm	Triple, 190mm	Dual, 237mm	Dual, 210mm
Warranty	Two years	Two years	Two years	Two years
Extras	N	mini-HDMI to HDMI adaptor	N	N

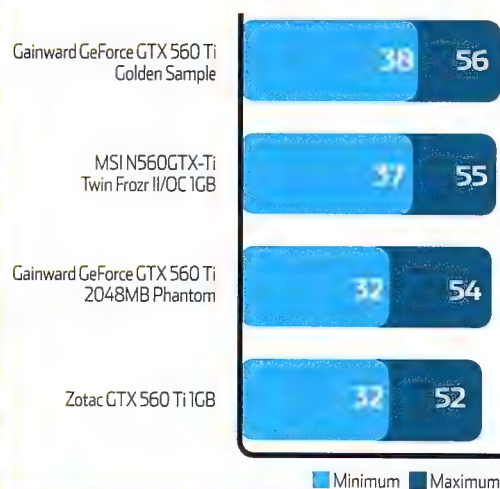
### ARMA II: OPERATION ARROWHEAD

1,680 x 1,050 4x AA 16x AF



### BATTLEFIELD: BAD COMPANY 2

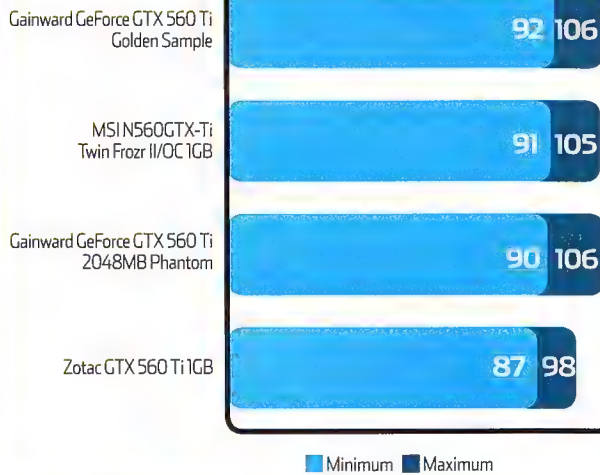
1,920 x 1,080 4x AA 16x AF



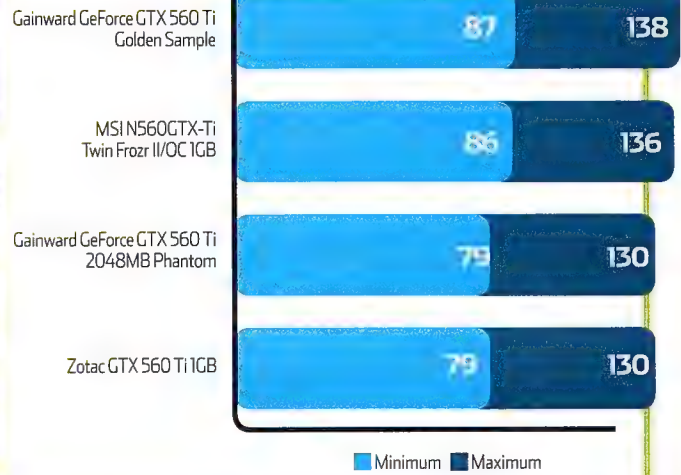


**COLIN MCRAE: DIRT 2**

1,920 x 1,080 4x AA 16x AF

**CALL OF DUTY: BLACK OPS**

1,920 x 1,080 4x AA 16x AF

**POWER CONSUMPTION**

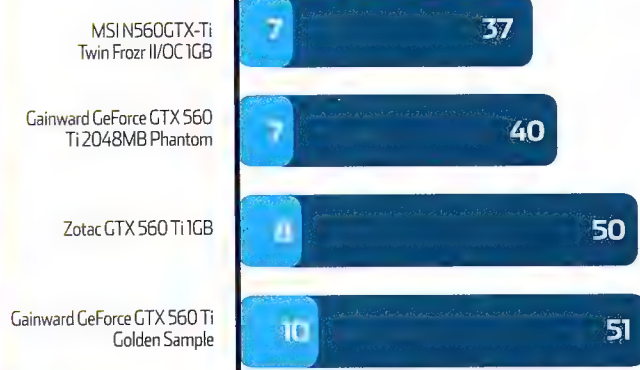
Total system power consumption



Watts (W) - Lower is better

**GPU DELTA T**

Absolute temperature minus ambient temperature



Celsius (°C) (lower is better)



# KITLOG

These are four of our basic systems, with something for every taste. **The Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. Our build may be a little more expensive than what you could technically get away with, but for that extra few hundred you're also getting cutting edge performance and one of the most overclockable chips you can get today.

Some say that a mouse is a personal choice, and that no review will ever come close to satisfying everyone. But some mice are just good enough that this doesn't really matter – such as the below Sensei. It's customisable enough that no matter your preference you can make it feel just right and, assuming you're not left-handed, it'll likely serve you for years to come. Great Christmas pressie, too!

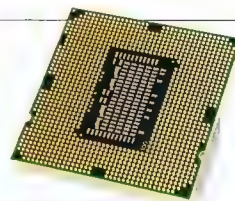


**The Perfect PC**, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – [www.atomicmpc.com.au/?NUMBER](http://www.atomicmpc.com.au/?NUMBER) – and you'll go straight to that review.

## THE GAME BOX

CPU



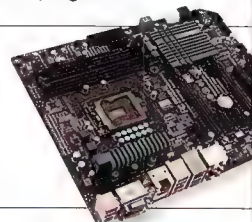
**Intel Core i5 2500-K**  
PRICE \$220

Sandy Bridge's combination of cost and overclocking prowess is awesome.  
*Issue 122, Page 36*

MOTHERBOARD

**Gigabyte Z68X-UD3H-B3**  
PRICE \$170

Affordable gaming performance and features.  
*Ref ID: 263631*



MEMORY



**G.Skill Ripjaws F3-10666CL7D-4GBRH**  
PRICE \$45

Great value, tight timings, and some flexibility.

VIDEOCARD

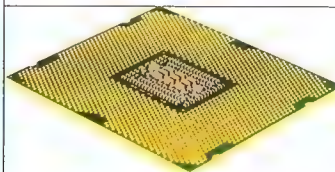
**NVIDIA GTX560**  
PRICE \$220

A reference-design card, but plenty fast for gaming bliss.  
*Issue 116, Page 38*



## THE PERFECT PC

CPU



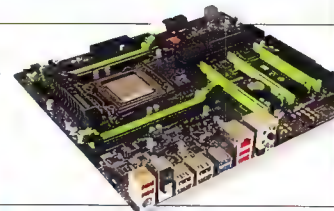
**Intel Core i7 3930K**  
PRICE \$700

Six cores of Sandy Bridge-E loving. Overclock for justice!  
*Issue 132, Page 32*

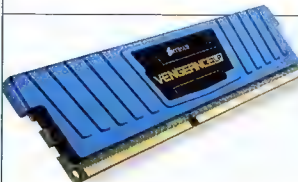
MOTHERBOARD

**Gigabyte G1.Assassin 2**  
PRICE \$470

It's about as super-premium as you could get, or want.  
*Ref ID: 281856*



MEMORY



**Corsair Vengeance Low Profile CML16GX3M4A1600C9B**  
PRICE \$100

16GB of fast memory. Virtualise everything!

VIDEOCARD

**ASUS Matrix Platinum GTX580**  
PRICE \$750

A beefy single-core card with thermals to match.  
*Ref ID: 274735*





SUBTOTAL: \$1509

RIG ONLY: \$1049



**Coolermaster Hyper 212+**  
PRICE \$40

Nice cooling for a very affordable price.

CASE



**Bitfenix Shinobi**  
PRICE \$79

Worth it for the price alone, and sexy to boot.  
*Ref ID: 260177*

**2TB HDD**  
PRICE \$90

Two thousand gigabyte storage drive on the cheap.



**Pioneer DVR-219L**  
PRICE \$35

Discs. You needs 'em.

KEYBOARD

**Razer Arcosa**  
PRICE \$50

A cool-looking keyboard that'll serve you very well.  
*Ref ID: 149483*



**Samsung S24A450BW**  
PRICE \$260

24 inches of LED backlit, 16:10 LCD screen. Sweet.

MOUSE



**Tt eSports Element Black**  
PRICE \$70

Accurate, comfortable and fast.  
*Issue 125, Page 39*

**Plantronics Gamecom 777**  
PRICE \$80

Solid set of cans with great audio.  
*Issue 101, Page 41*



**Onboard Realtek ALC889A**

A decent chip that does the job.

POWER SUPPLY

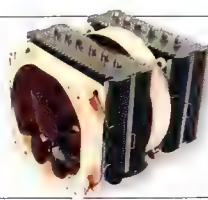
**Corsair HX-650**  
PRICE \$150

A solid PSU, ready to power anything you throw at it.



SUBTOTAL: \$5259

RIG ONLY: \$3935



**Noctua NH-D14 CPU Cooler**  
PRICE \$95

Bulky, yet quiet and effective. Or skip this entirely and water-cool!  
*Issue 122, Page 47*

CASE

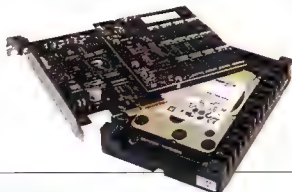


**SilverStone Temjin TJ11**  
PRICE \$600

The best and only case you'll ever need. Premium luxurious bliss.  
*Ref ID: 257544*

**OCZ REvo Drive x2 & WD 600GB VelociRaptor**  
PRICE \$580 + \$320

Superfast SSD with zippy storage.  
*OCZ: Issue 121, Page 43*  
*WD: Ref ID: 220323*



KEYBOARD

**Razer BlackWidow Ultimate**  
PRICE \$160

The new benchmark in gaming quality.  
*Ref ID: 251095*



**Dell U2410**  
PRICE \$699

In-Plane Switching, 1.07 billion colours and 24 inches.

MOUSE



**SteelSeries Sensei**  
PRICE \$115

The best-performing mouse we've used to date!  
*Ref ID: 276668*

**ASUS Xonar Xense**  
PRICE \$350

Odd package, but the card alone is awesome.  
*Issue 124, Page 41*



POWER SUPPLY

**Antec HCP 1200W**  
PRICE \$320

Plug in a graphics card. Or four. The HCP won't care.  
*Ref ID: 272588*





The **LAN Rig**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

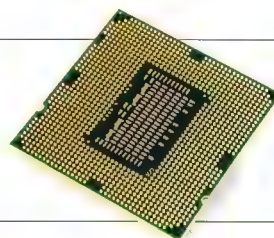
Though November has come and gone it seems we're going to be stuck with the current slew of graphics cards over the Christmas break – past years have seen major shakeups at just this time. But until next year brings around new cards you'll be just as well-served by the GTX560 for most of your gaming needs (so long as you compromise on Anti-Aliasing and resolution).



Finally, for the more entertainment-minded – and really, that's all of us – there's **The Mini**, ready to play movies and music quietly and efficiently. The basic guts are fast enough for general tasks, and the IGP can handle High-Definition content. You can also choose from three entirely optional upgrades to suit your needs best: a graphics card for WoW, TV tuner to catch the game, or a Wireless card to sync without cables. The perfect energy-conscious build.

## THE LAN RIG

CPU



**Intel Core i5 2310**

PRICE \$190

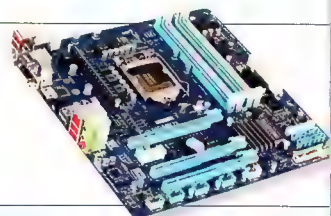
Intel's most affordable quad-core, overclocking limited.

MOTHERBOARD

**GIGABYTE Z68MA-D2H-B3**

PRICE \$150

A MATX board with everything you need.



MEMORY



**G.Skill Ripjaws F3-10666CL7D-4GBRH**

PRICE \$45

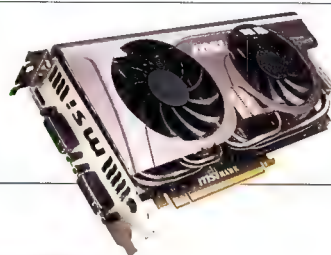
Great value, tight timings, and some flexibility.

VIDEOCARD

**NVIDIA GTX 560**

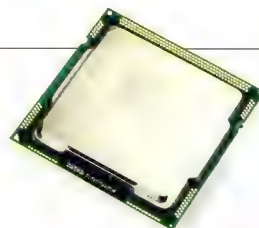
PRICE \$220

A reference-design card, but plenty fast for gaming bliss.  
*Issue 116, Page 38*



## THE MINI

CPU



**Intel Core i3 2100T**

PRICE \$150

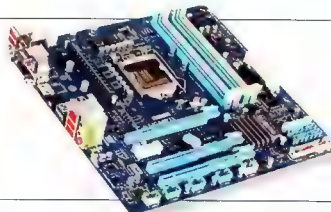
Super low-heat dual-core processor with IGP.

MOTHERBOARD

**GIGABYTE Z68MA-D2H-B3**

PRICE \$150

A MATX board with plenty of storage options.



MEMORY



**G.Skill Ripjaws F3-10666CL7D-4GBRH**

PRICE \$55

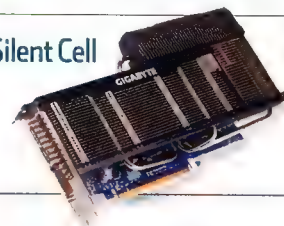
4GB of fast memory is plenty for running multiple HTPC media streaming apps.

VIDEOCARD

**Gigabyte HD6770 1GB Silent Cell**

PRICE \$145

Enough to play games on, and adds outputs without extra noise.





SUBTOTAL: \$1405

RIG ONLY: \$1050

COOLER



**Antec Kuhler 620**  
PRICE \$90

Show off your 1337 rig with watercooling. Aw yeah.

CASE



**InWin Dragon Slayer**  
PRICE \$80

Tiny case with great potential, it's got it where it counts.

SYSTEMDRIVES

**2TB HDD**  
PRICE \$90

Two thousand gigabyte storage drive on the cheap.



**Pioneer DVR-219L**  
PRICE \$35

Discs. You needs 'em.

KEYBOARD

**Razer Arctosa**  
PRICE \$50

A cool-looking keyboard that'll serve you very well.  
*Ref ID: 149483*



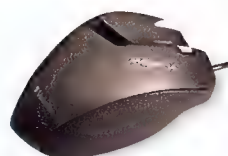
DISPLAY



**Samsung BX2240**  
PRICE \$160

21.5 inches of value-packed screen, great buy.

MOUSE



**Verbatim Rapier V1**  
PRICE \$65

Great gaming performance and nifty features.  
*Issue 96, Page 43*

AUDIO

**Plantronics Gamecom 777**  
PRICE \$80

Solid set of cans with great audio.  
*Issue 101, Page 41*



**Onboard Realtek ALC889A**

A decent chip that does the job.

POWER SUPPLY

**Corsair HX-650**  
PRICE \$150

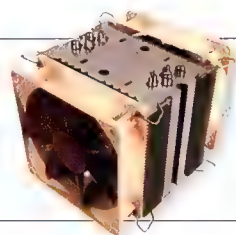
A solid PSU, ready to power anything you throw at it.



SUBTOTAL: \$1455

RIG (NO OPTIONS): \$1070

COOLER



**Noctua NH-U9B SE2**  
PRICE \$65

Plenty of cooling, and quietness to boot.

CASE



**Silverstone Fortress FT03**  
PRICE \$190

The best HTPC case we've seen yet, with space for plenty o' bits.

SYSTEMDRIVE

**2TB HDD**  
PRICE \$90

Buy three of these for super-crazy storage capacity.



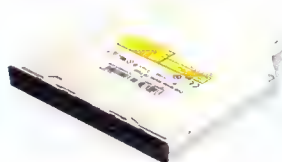
COOLING

**Scythe SFF21D**  
PRICE \$30 x 3

Replace the stock fans and hear the computer no more.



OPTICAL



**Silverstone SOD02B**  
PRICE \$80

Slot-loading DVD drive for movies, installs or backups.

KEYBOARD



**Logitech diNovo Edge**  
PRICE \$240

Wireless board with a trackpad for mousing.

TVTUNER

**Leadtek Winfast PxDVR3200 H**  
PRICE \$100

Get TV in your PC.  
H.264 recording ftw!



WIRELESS

**ASUS PCE-N13**  
PRICE \$45

Zippy 802.11N for wireless HD video streaming.

POWER SUPPLY

**Seasonic X-460 Fanless**  
PRICE \$200

"Look, ma, no fans!"  
-Anonymous, 2011





# ALUMINIUM PC CASE



**LIAN LI**  
www.lian-li.com

**M/B: HPTX 13.6" x 15"**  
**PCI: 10 slots**

## THE HAMMER

**THE SMALLEST HPTX CASE YOU'VE EVEN SEEN**

**PC-90B**

- Bays: 5.25" x 2, 3.5" internal x 6, 2.5" internal x 6
- I/O ports: USB 3.0 x 2 (20 pin-plug) / E-SATA x 1 / HD Audio
- Dim.: 230 x 512 x 489 mm
- Colour: silver / black

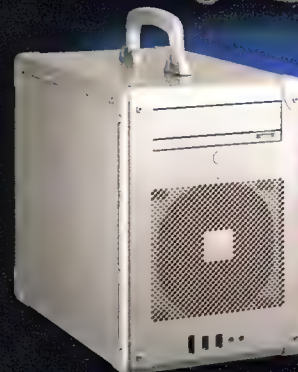
**PATENTED SCREW-LESS  
SIDE PANELS**



**PC-Q25B**

- M/B type: Mini ITX
- Bays:  
3.5" internal x 7 (Hot swap x 5),  
2.5" internal x 3 (use 3.5" x 2)
- Dim.: 199 x 280 x 366 mm
- Colour: silver / black

## ADVENTURER



**PC-TU200A**

- M/B type: Mini DTX, Mini ITX
- Bays: 5.25" x 1, 3.5" x 4 (Hot swap),  
2.5" x 2 (use 3.5" x 1)
- Dim.: 220 x 320 x 360 mm
- Colour: silver / black

**PC-X2000**

**\*\* A WINDOW TO THE SOUL \*\***

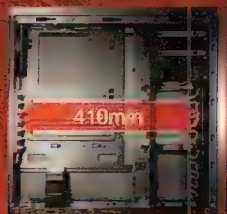
You love your PC. You recognise & appreciate quality.  
**NOW LIAN LI & MITTONI ARE RECOGNISING & REWARDING YOU!**  
If you purchased a TYR X-2000 case from an Aussie reseller,  
contact them to claim your **FREE SIDE WINDOW PANEL!**  
(Shipping fee may be applied)

**\*\* THE GREAT USB3 GIVEAWAY \*\***

Lian Li cases are now equipped with USB3!  
For most models not factory equipped,  
Lian Li & Mittoni are giving away  
**FREE SUPERSPEED USB3 upgrades** with  
your purchase of a case.  
Check [www.mittoni.com.au](http://www.mittoni.com.au) for free upgrade  
models & more info.

**FIRST  
KNIGHT  
SERIES**

BATTLE IS WHAT I DO



- External in black anodized finishing & internal finishing in black coating.
- Supports long graphics cards.

**Superb Thermal & Silent Performance. Patented Tool-less / Anti-vibration Features Designed for PC Game Enthusiasts and Professionals**

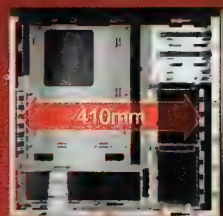


**PC-K9 B**

**PC-K9 WX**

## Lancool

**Aluminium panels**



- External in black anodized finishing.
- Supports long graphics cards.

**USB3.0**  
20 pin-plug

- Bays: 5.25" x 3, 3.5" internal x 6,  
2.5" internal x 4
- M/B type: ATX / M-ATX
- PCI: 8
- Fan: Front 140mm x 2,  
Rear 120mm x 1
- I/O port: USB 3.0 x 2 (20 pin-plug) /  
HD Audio
- Dim.: 210 x 470 x 500 mm (W,H,D)

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Taiwan**





## Dan Rutter wants to collect something with meaning.

**W**hen I read Atomic's collectors' guide to classic consoles (in issues #128 to #130, in case you missed it), it didn't do much for me. That's only because I've never been a console gamer, though.

What it did do, though, is propel my thinking in a dangerous direction. Toward classic *computer* collecting.

I don't mean the old and busted network cards that tend to accumulate in every PC gaming enthusiast's house. I mean hardware with real significance in the history of computing.

Different people want different things from a collection. Personally, I'm interested in computers that still actually work, and can be used for something. Even if it's just playing a

flavour of Apple II, a Commodore 64, an Atari ST, a couple of those Amigas I never shut up about. (An Amiga 1200 booting from a CompactFlash card may be the world's most practical vintage computer.)

The less obvious stuff is all the more interesting. The original 1995 IBM ThinkPad 701, with its "butterfly" folding keyboard. Still an amazing bit of design today.

The 1983 TRS-80 Model 100 portable computer. Some writers still use one of these, because it's got a proper keyboard and a usefully large mono LCD screen, and it runs for a long time from four AA batteries. Transferring stuff to and from modern computers via serial.

A couple of MicroBee 256TCs. One to

Macintosh, which was great to play with but almost entirely useless. The Apple IIGS, which sold (or, more accurately, failed to sell) alongside early Macintoshes, but had broadly *better* specifications. The small but imperfectly-formed G4 Cube.

The Sinclair ZX81 doesn't make the cut in the "useful for something" department, since it's only barely more practical than an Altair 8800. The ZX Spectrum, though, was a phenomenal success in the UK and has an immense library of games that're object lessons in wringing performance out of very modest hardware.

One day, there'll be an iPad 3, a 22nm Core i7 and a 6000-series Opteron in the museum next to the Apple IIe and Amiga 500. And I bet I'll still be wondering why nobody sells a laptop with a butterfly keyboard. (P)

## Personally, I'm interested in computers that still actually work, and can be used for something.

game in the authentic wonky-colour Apple II Hi-Res mode, or word processing with no chance of being distracted by the Internet, because the computer you're using is ten years before they had Web access.

I also want relatively "ordinary" computers, not the Lamborghini Miuras and Mercedes 6.9s of the computing world. I'm sure there's someone out there with an AT&T 3B2, a PDP-8 and an Apple Lisa in their collection, but I, personally, am not crazy enough to be interested in anything that sells for more today than when it was new.

(And then there's the *real* stratosphere of the computing world, things like old supercomputers that're about as affordable as a Bugatti Royale. You'd probably find it much easier to get a 1928 Bugatti running than, say, a Cray 1, because the Cray's power consumption is, I kid you not, more than 100,000 watts.)

Some of the contents of my hypothetical vintage computer museum are obvious. Some

relive the high point of Australian educational computing, and one to swap with someone in the UK for an Acorn Archimedes, the corresponding high point for the British. And the one true platform on which to die constantly while attempting to play *Zarch* (a.k.a. *Virus*, on less collectible computers).

A whole shelf of PDAs, that entire ecosystem of computing hardware that slowly grew and blossomed, and was suddenly annihilated by the apocalyptic impact of an asteroid called "the smartphone." I've written about these before ([dansdata.com/gz045.htm](http://dansdata.com/gz045.htm)), but there are now even more hilariously cheap, pocketable computers all over eBay. The newer ones are now likely to have a standard memory-card socket, or IrDA that actually works, for moving data to and fro. A Psion Series 5 isn't quite as much fun to play with as a butterfly ThinkPad, but it's close.

Any number of weird Apple products. The original hard-drive-less 128-kilobyte

Perhaps one day we'll find Dan's brain in a museum?

[dan@atomicmpc.com.au](mailto:dan@atomicmpc.com.au)





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# TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED



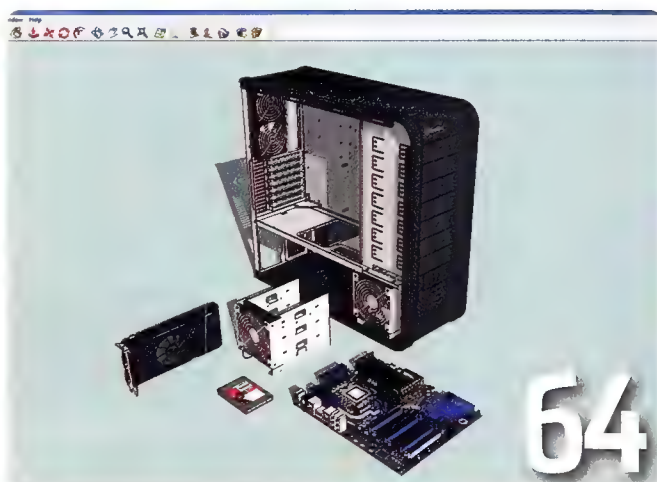
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# For the good of the nation



**Chris Taylor wants you!... to consider a military career.**

**F**or a good few years now, the Australian Defence Force, the Australian Security Intelligence Organisation (probably just 'ASIO' to you) and the Defence Signals Directorate (the arguably less well known 'DSD') have been drumming the recruitment, er, drums rather loudly. This magazine and its website, as well as other Australian websites whose readership is largely made up of young folk, often play host to advertisements letting you know that you should sign up today to help defend our shores from the dastardly and the wicked. Presumably the logic boils down to figuring that if young geeks like machine-gunning terrorists and ultranationalists and whatnot in *Call of Duty*, they'd maybe entertain the idea of doing that for a living (the US Army followed this train of thought to a logical endpoint by freely releasing the online shooter *America's Army*). And yes, yes, we know that there's a lot more to the military than using machine pistols to head-shot extremists.

Our defence force – and here we're using it as a blanket all-encompassing term that rolls up the ADF, ASIO and DSD – is always recruiting, or at least runs recruitment drives on a very regular basis. All three draw recruits from a wide range of backgrounds, from people who've just finished school, to those qualified to do some sort of trade, such as teaching or medicine. The ASIO and DSD organisations in particular actively seek out graduates from all manner of faculties and fields, including information technology. Jobs are on offer for people totally inexperienced (i.e. graduate positions), to those who've spent a few years in some other industry. Skills applicable to 'normal' jobs are applicable to ASIO, DSD and even a fair bit of the ADF.

## Shh...I'm hunting wabbits

ASIO is, for obvious reasons, secretive. The expectation is that you'll also be secretive: posting stories on the forums or trying to impress women at the local pub just won't do when it comes to matters of national security. People probably know ASIO for the infamous 'be alert but not alarmed' terrorism ads circa 2002.

The careers page of the website doesn't reveal a whole lot, other than that the organisation recruits people for roles ranging from 'intelligence professionals' (a job that supposedly doesn't involve running around with a gun and presumably doesn't come with a taxpayer-funded supply of fine European booze and automobiles), to linguistics, to IT. The only details that are immediately obvious: surveillance roles involve following suspected baddies around and shooting them with a Nikon or Canon with a telescopic lens. Linguistics involves translating



stuff. Presumably, IT even covers computer use (who knew?).

You apply through the website when jobs become available: there isn't an constant recruitment drive running like you see with the Army, for example. For some roles, at least, there are no specific requirements other than being an Australian citizen and not being a totally dodgy bastard. The whole idea (for obvious reasons when it comes to surveillance roles) is to reflect the diversity of the Australian community. At the same time, don't think that ASIO recruits just anybody. The volume of job applications they receive is supposedly significant. Competition is fierce.

## ADF: Few prerequisites

The Department of Defence is the umbrella that encompasses the ADF and DSD. The ADF, of course, is made up of three branches—the Air Force, Army and Navy. Each of these three branches of the ADF recruits people from all manner of backgrounds with all manner of career goals, ranging from would-be cooks, to tradespeople, to frontline soldiers. You don't need to come to the ADF with an existing qualification or prior experience—you can apply to join straight out of school or maybe after doing a couple of years of nothing in particular (perhaps a good choice for you *Skyrim* addicts), and receive all of the training and education you need through the ADF itself. That being said, there are graduate positions available to those who've studied something particularly useful and relevant to the ADF's needs—think a medical degree or a Bachelor of Engineering. Applicants from such backgrounds may also be eligible to receive accelerated officer training.

Even if your degree isn't in a field that the ADF is especially interested in, it's likely to be regarded favourably—similar to if you joined, say, the police force or customs after graduating from your Bachelor of Arts or Business.

The ADF used to try and recruit youngsters with the good old 'we pay you to study' shtick. They still do that. Understand, however, that the deal isn't that they'll pay for you to study a double degree of games development and media creation studies. Engineering or medicine: they'll pay for that. And they'll only start to pay for it once you've paid your own way for a year. Don't even think about using it to get an inexpensive Bachelor's degree out of them before running off to work for someone else—if they invest in you, they'll expect something from you in return. The ADF has its own university (their academy in Canberra), and graduation from which requires more than academic smarts—you're required to conquer a number of soldiering-related tasks.

Unlike ASIO and the DSD, the ADF demands you come to them physically fit and ready for what they'll throw at you in basic training. The requirements aren't unreasonable—they're not expecting you to have the capabilities of a professional athlete—but you need to be able to run around and lift things and do all of it without passing out. The website lists the fitness-related requirements and features some potentially useful resources, including beep test recordings and a four-week fitness program designed to take the average person off the street and mould them into someone the ADF can work with.

## Cunning linguists

The DSD is, as we said, less well-known than



ASIO and the ADF. Its role is, essentially, to gather data related to matters of national security. It then passes on information to other agencies. They recruit people, both experienced and inexperienced (i.e. graduates) from IT backgrounds, as well as other backgrounds—commerce types, linguistics and 'analysts' (who may have studied arts, maths, science or politics). Unlike ASIO, DSD are very open and explicit about what they want—people with qualifications and experience in programming, hardware engineering, networking and computer science.

experience in some non-IT branches of the agency in addition to being trained in your area of interest.

Keep in mind that, as with ASIO, there's the expectation that you'll move to Canberra – for training, at least – and possibly for some or all of your time with the DSD. You also need to be respectable enough to pass a background check and gain a security clearance (i.e. a clean criminal record), and restrained enough to not spill the beans about national secrets in public.

The Department of Defence also recruits for

similarly high, of course. And the intense secrecy involved with even being one of their in-house tradespeople is probably a turn-off to some who romanticise intelligence work and figure a job as a 'spook' could aid them in bedding supermodels (men or women or both). Don't assume that because they don't have UN-like requirements—minimum of a Masters degree, minimum of fluency in two major languages—that their standards are easily met.

The ADF presents physical challenges. Even cooks and technicians must be physically fit and capable. Unlike the ASIO and DSD, however, it's possible to get a fair idea of what a full-time career in the ADF is like prior to signing up. If you're still in school you might be able to join the cadets program. The ADF also recently introduced a 'gap year' program for students who've finished year 12 and are looking for something to do with themselves between school and tertiary studies at university or TAFE. There's no guarantee of future employment with the ADF, but there's the potential to apply to stay on if you feel you've found your niche. There's also the opportunity to take a walk down washout lane at any time during the first 80 days of the program if you feel that the military really isn't for you. Finally, there are the air force, army and navy reserves which offer similar positions to those interested in a military career.

## You need to be respectable enough to pass a background check, and restrained enough to not spill the beans about national secrets in public.

Each year, the DSD runs a graduate recruitment program that closes sometime in April ... for the following year. As in, you apply in early 2012 for the 2013 intake. If you're a successful applicant—we're assuming you'll find out early—you have a long time to think about it. The graduate program, so far as these sort of things go, sounds interesting in that the idea is to give you a well-rounded introduction to a career at the DSD—you'll spend a bit of time and gain

other roles, ranging from research to geospatial engineering. The Department's website ([www.defence.gov.au](http://www.defence.gov.au)) has more information about specific careers on offer.

### It's not a walk in the park

The ADF, ASIO and DSD offer their own set of challenges. Even entry-level positions at ASIO and DSD (i.e. trainee surveillance officer at ASIO) pay reasonably well. The standards are



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# how to... Use Google SketchUp

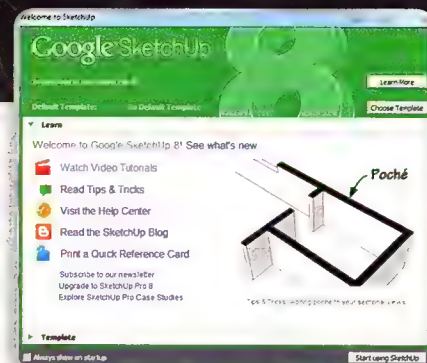
**Antony Leather** shows you how to use Google's free 3D software to plan your next mod.

**M**easure twice and cut once is a familiar phrase among DIY enthusiasts, but it holds true with PC modding too. Planning your work is essential to avoid mistakes, and ensures that everything fits together. Drawing detailed diagrams on pressed sheets of tree is a start, but there are even more elaborate ways to create plans and designs. One of the most popular is to use a 3D rendering program to create a virtual model of your project, which you can then tweak to your heart's content. Google's SketchUp is a free rendering program that can prove to be an invaluable tool, and is very popular with modders. Even if you're only planning a small mod to your case, SketchUp helps you avoid any pitfalls and provides assistance in the design process too. We'll show you the basics, allowing you to master SketchUp in just a couple of evenings.

1

## DOWNLOAD AND INSTALL SKETCHUP

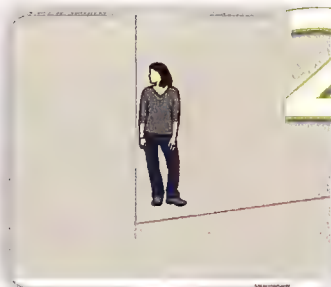
Go to <http://sketchup.google.com>, and download and install SketchUp. Google also sells a Pro version of the program, which offers more powerful modelling, but we'll get to grips with the basic version first. There's a wealth of guides and videos too, the latter of which can be found on YouTube, so if you still need some help after reading this guide, that would be the place to start.



2

## GETTING STARTED

Open SketchUp and select a unit of measurement, with which you can specify the size of objects. Centimetres is generally a good choice. You'll then see a grey background, toolbar and coloured lines that each represent an axis. Your scroll wheel allows you to zoom while the scroll button is assigned to the orbit tool, which allows you to rotate the view. Holding down shift allows you to pan across the screen, or you can use the panning tool: the white hand symbol in the toolbar.



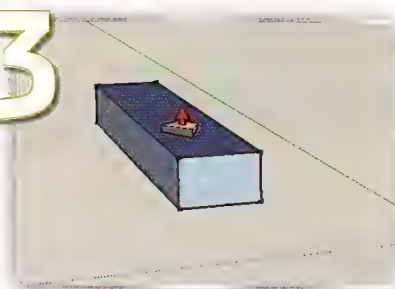
## tools you'll need

- **Lots of patience** – it can be incredibly fiddly at times, and you may feel the urge to grind your face against the screen in a moment of insanity. This is normal.
- **Google SketchUp** – Available from <http://sketchup.google.com>, it's a free download and install.
- **Pre-modelled components** – Available to download at <http://scc.jezmckean.com/home>, these save the worst of the face-grinding in most circumstances.
- **Video Tutorials** – Online at [www.youtube.com/user/SketchUpVideo](http://www.youtube.com/user/SketchUpVideo), these are essential for the times you get stuck up sketch creek without a pointer.

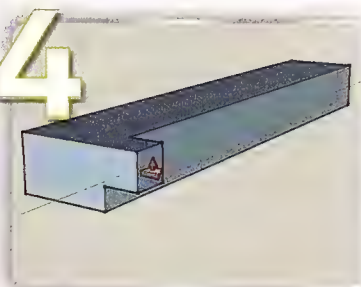
## CREATING 3D OBJECTS

The key principle behind SketchUp is transforming 2D objects into 3D shapes. Start by selecting the rectangle tool (a brown square in the toolbar) and create a small square by clicking on the screen and using the mouse to expand the shape. Now select the push/pull tool (a 3D square with a red arrow pointing out the top), hover over your shape and when dots appear on its surface, click and hold the left mouse button. Move your mouse vertically to push and pull the shape, giving it depth.

3



4

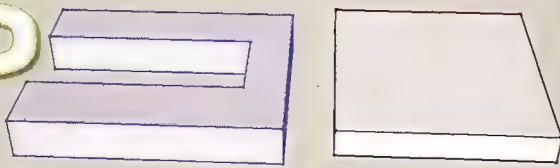


## EXPAND YOUR OBJECT

Now select the rectangle tool again and create a smaller square on the surface of your new 3D object. Select the push/pull tool and drag this shape into 3D. This is the first step in creating objects – use the rectangle or circle tools to create a 2D shape, then use the push/pull tool to drag these into 3D objects. Go to the 'View' menu and under Toolbars, select 'Large Tool Set'. This will enable you to easily create objects of different shapes, such as polygons and circles. You can even create your own shapes using the line tool, which looks like a pencil.

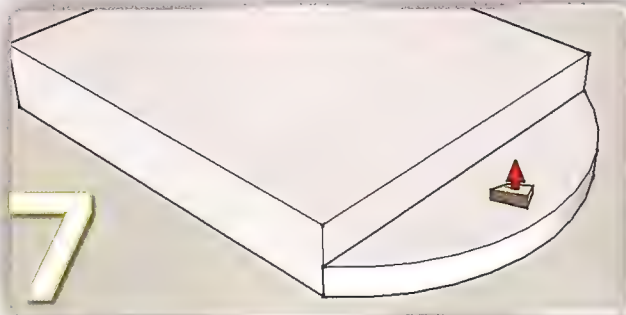


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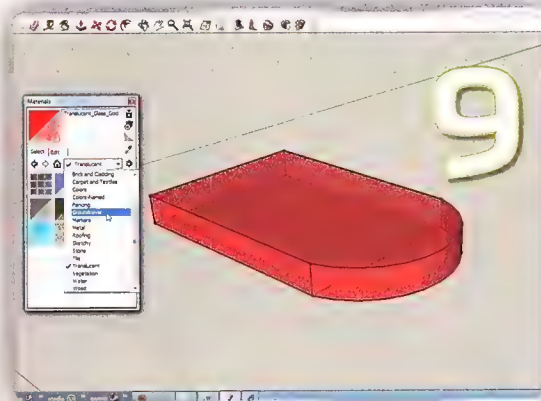
## SELECTING AND MOVING OBJECTS

Being able to move objects is important – there are numerous pre-rendered PC components available that you can download and insert into your render to save time. To move an object, first select it by clicking on the select tool, which is shaped like a black arrow. Holding down the left mouse button, select the part of the object you want to move, which will appear blue. You can select the whole object by triple-clicking on it anywhere, while double-clicking will select the 2D surface on which you click. To move the object, select the move tool – a red cross of four arrows – and drag.



## CREATING CURVES

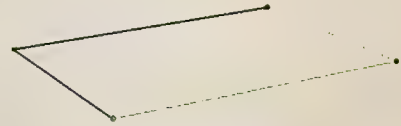
Create a single line as the basis for your curved edge. Select the curve tool, then set the start and end point for your curve by clicking on the two end points joined by that single line. You can then create the curve along the same axis. You can work with the new surface in much the same way as a square or rectangular one. We've used the push/pull tool to raise the surface into a 3D extension of our cuboid. To raise it to the same height, we can use the alignment feature, hovering the cursor over the nearest top corner of the cuboid and then releasing the cursor. We've also deleted the join line on the top surface – it isn't necessary, and gives the render a professional look.



## COLOURS AND TEXTURES

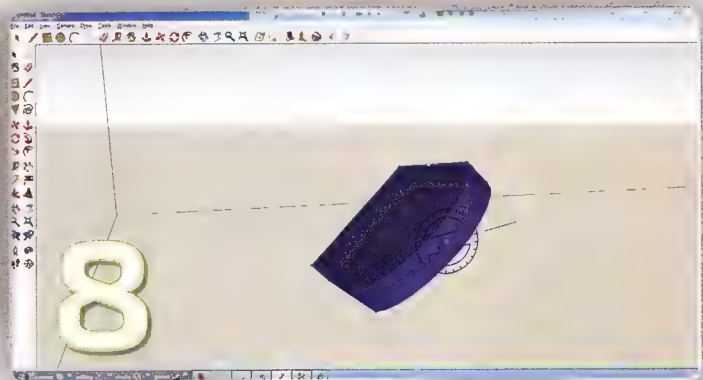
SketchUp includes a large array of colours and textures for you to add to the surface of your objects. This gives you some insight as to whether your new PC build's colour choices are the best options. It can also help to visually distinguish different components. Locate the paint bucket tool and click on it. This brings up a small toolbox, with the most important part being the dropdown menu. From this you can select solid and translucent colours, and textures such as brick and metal. To apply the colour, simply click the bucket on a surface of your object.

6



## ALIGNMENT

SketchUp can help you to draw objects of the same length or width. Draw a line – it will have dots on the end, called end points. Hover over one for a few seconds and it will be followed by a coloured line; this colour corresponds to the axis, indicating where to draw the next line to make a right-angled join. Create another line roughly equal in length to the previous one. To create a rectangle, click on the outer end point of either line. Then move the cursor over the opposite endpoint for a couple of seconds. Coloured guidelines should appear, showing you the way.



8

## ROTATING OBJECTS

It sometimes helps to create your object on one axis, then rotate it to fit in another. Thankfully, you're able to rotate objects very easily, so you can create them in whichever axis you prefer. Once you've created the object, select the entire object as described above. Now select the rotate tool – two curved arrows pointing in opposite directions. You can rotate your object in a number of different ways, but SketchUp makes it easier if you rotate using end points or mid-points.



10

## IMPORT OBJECTS

It will take some time to master SketchUp, but you should be well on your way in a few evenings. To save time, you can import pre-rendered objects. A great collection of PC-related objects can be found at <http://scc.jezmckean.com/home>, including motherboards, cases and even water-cooling components, which you can import into a single instance of SketchUp to build a virtual PC. It's also worth checking out the official SketchUp YouTube channel at [www.youtube.com/user/SketchUpVideo](http://www.youtube.com/user/SketchUpVideo) for various tutorials. Once you've sketched hardware in, take some screenshots and upload them to <http://forums.atomicmpc.com.au> to show off your handiwork.



# how to...

# Add cable-routing holes

**Antony Leather** whips out the tools to gain some much-needed flexibility.

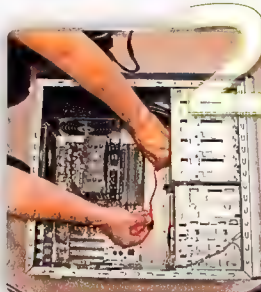
**B**uilding a PC can be a pleasure or a pain, depending on which case you have. Cable-routing holes in particular make threading power and data cables between your hardware a simple task, and make cable-tidying a far easier and quicker job. Thankfully, case manufacturers appear to be listening to our rants and modern cases are usually a joy to work with, compared to those around a few years ago. However sometimes you'll want to hang onto an older case for a second system, or thread a cable through a currently-solid piece of case. This following guide will help:

## tools you'll need

- **Rotary tool with metal-cutting disc** – An essential tool for a multitude of modding jobs. Most well-known brand is Dremel, but there are others too.
- **Grinding stone rotary tool attachment or metal file** – Usually made of carbide or steel, these are useful for adding a professional finish.
- **Edge trim** – Also known (and sold) as u-channel, this is a rubber skirting that protects cables (and fingers) from sharp edges.
- **Masking tape** – It's like duct tape, but for masking. More helpfully, it's paper-based and removes from metal surfaces very easily, leaving little to no residue behind if applied for short periods.
- **Can of compressed air** – Pressurised air for blowing dust and bits of metal from your case. Also useful if a giant maid-bot steals your planet's atmosphere. Better stock up.
- **Eye protection** – This pretty much begins and ends with safety glasses. Already have a pair of reading glasses or sunnies? Well they're not good enough. Spend a few bucks for better eyeball protection.

## 1 CHOOSE A LOCATION

If you've felt the need for cable-routing holes in your PC case, you probably have a good idea about where you'd locate them. A good example would be both below and to the right of the motherboard, as with most modern cases, allowing power cables from the PSU and data cables for the storage drives to be routed neatly behind the motherboard tray. Never attempt to do this with hardware installed into the case. Metal fragments can get lodged places you don't want them, and can cause short circuits – not to mention the damage your cutting tool could wreak on unsuspecting circuit boards.

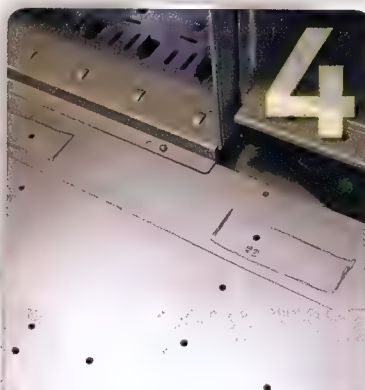


## 2 HOW LARGE DO I CUT?

This will depend entirely on how many cables you intend to route through the case. If you have a single hard disk and optical drive, and a single graphics card, two holes should suffice. A lot will depend on the case too, and how close to each other the various components are situated. The point is to route the cables out of sight, not to clump them together into thick ropes; so if your hard disk is mounted a long way from your optical drive, there's little point trying to route both through the same hole.

## MEASURE: TWICE

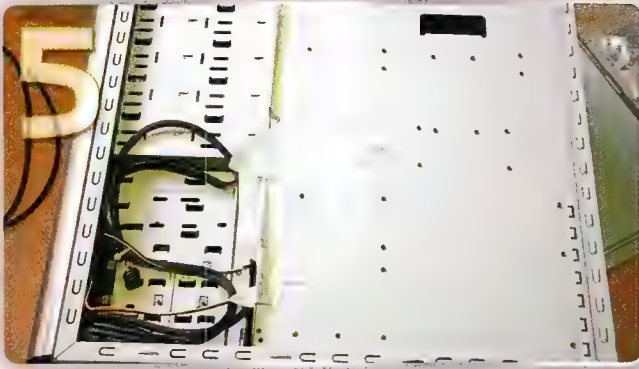
Now you know how many holes you'll need, it's time to measure up. The size of the holes will depend on the cables you're routing through them. For SATA cables, a hole 2cm x 3cm will be ample. This might sound large for a single SATA cable, but we'll be adding edge trim to the hole, which will use up some of this space. Power connectors can be tricky, as their plastic ends need quite a lot of space. If you're unsure, cut a section of edge trim to the size you're intending on cutting the hole in the case. Try to fit all the cables through this, which should help you gauge the size required. After you've measured, using whatever device you have handy (whether it be ruler or measuring tape), measure again and double-check your initial measurements were correct – once you cut you will not be able to start over.



## 4 MASKIN' IT UP

Having decided on the location and size of the holes, it's now time to mark up your case ready for cutting. If it's an old case that you don't particularly want to show off, feel free to mark outlines of the holes directly to the motherboard tray with a pencil. If this is your main case you're hoping to shoot afterwards, or merely have some form of love and attachment to it, we recommend applying a layer of masking tape beforehand – which will likely save the metal from errant scratches and dings.





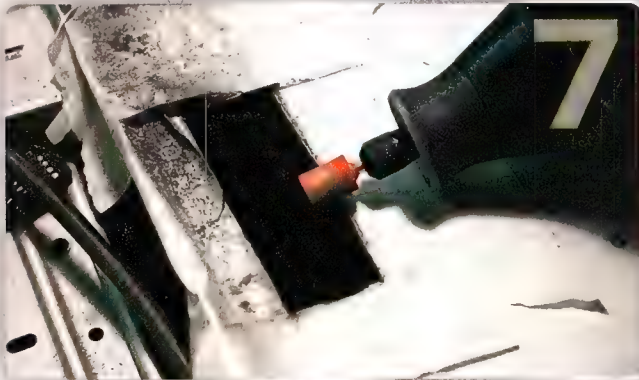
### GATHER YOUR TOOLS

With the soon-to-be-holy areas marked up, you'll need to plug in your cutting equipment and make sure the case is placed on a flat, level surface, preferably with good lighting. This should prevent any slips from scoring the motherboard tray, which will look unsightly. Your hardware should be removed, although fans can be left in place if protected with newspaper and masking tape, which should save some time. Remove any drive cages and, if you have a removable motherboard tray, remove it from the case. Wearing eye protection is essential, as you'll be cutting through thick metal sheets. Better put those safety glasses on now.



### MAKE THE INCISION

Start by using a metal-cutting wheel to score the long side of one of the holes. This will give you a feel of how much pressure you should apply. Continue to cut along the line in slow strokes until you cut through. Cut the holes in square shapes – you'll be able to make them into circular shapes later. Don't worry about cutting them to perfection either, as the edge trim will hide any small mistakes.



### SMOOTH THE BUMPS

Even though we'll be using edge trim, it's still good practice to sand the edges of freshly cut metal to prevent injury. You can do this using a small metal file, or a grinding stone attachment for your rotary tool. Gently sand the edges of the hole from both sides to remove flakes and sharp edges until they're smooth to the touch. This also prevents cable damage if ever the trim is dislodged.



### APPLY SHAPE

Grinding away at the rectangular hole will also allow you to shape it, although the edge trim can reduce the square look significantly. Use a low speed setting at first to gauge how quickly the stone cuts into the metal – aluminium won't take long, but steel will require more work. Be patient and you'll have a nicely-rounded hole in no time.



### APPLY EDGE TRIM

The edge trim is optional, but will make the holes look neater and more professional. Apply the trim to the hole and press it firmly in place, leaving 5mm or so of overlap. Cut it to length and gently trim it so that the ends fit neatly together.



### CLEAN THOROUGHLY

It's very important to remove any metal dust and flakes from the case before you install your hardware to prevent any catastrophic short circuits if they were to find their way onto your hardware. A blast with a can of compressed air, a run-over from a vacuum cleaner with brush attachment, and a visual inspection is recommended. If you can still see shards sticking to the case, wiping with a wet cloth should remove the debris. Chuck your hardware back in, take photos, and upload them to <http://forums.atomicmpc.com.au/> for all to admire.





## Chris Trowbridge on whether Intel's Smart Response Tech is worth your while.

**A**re you always the last one loaded in your favourite shooter? Does Windows take 'forever' to boot when compared to your mate with the shiny new (and expensive) SSD? Have you not created your own FreeNAS solution, and as such you store all your data on your PC? Are you therefore doomed to slow disk access due to your need for large storage? There may be an answer yet, in Intel's Smart Response Technology (SRT).

The Intel Z68 chipset bundles some new features along with the usual enhancements you'd expect from a new mobo. One new feature, SRT is the current incarnation of what has been known as Intel Matrix RAID in previous generations. SRT takes the concept a step further, however, and allows you to add a small (relatively inexpensive) SSD as a cache to speed up your normal 'spindled' hard disk. This is an excellent feature as it means you can add a SSD to your beloved rig in the future when it begins to feel a little slow, and not lose your data. The natural question is whether this is effective or not. To discern this we will have to run a few simple benchmarks.

### IQ test

Benchmarking is an interesting subject as different benchmarking programs rarely agree on performance, and the numbers produced can be interpreted many different ways. Hard disk manufacturers often quote

benchmark results to 'prove their edge' over the competition; however these are usually obtained in very specific scenarios. As such our benchmarking will be focussed around comparative results rather than the absolute values, and we'll note the 4k and large file results.

### The Rig

My test rig consists of a GIGABYTE Z68-UD3R-B3 mobo, running a 2500K Sandy Bridge CPU and 8GB of Kingston HyperX RAM. I have a WD20EADS spindled hard disk (SATA2) for testing. This disk is common and large but not exceptionally fast, and it does not support the 4k formatting enhancement. The Z68 chipset supports SATA3 natively and so I have bought a SATA3 based SSD, the 60GB OCZ Agility 3. This SSD is quite small and hence not too expensive, and cost around \$150 at time of writing.

### Baseline testing

The first step in our analysis is to get a 'baseline' of performance for our hard disk and SSD. Two common benchmarking tools; ATTO Disk Benchmark and CrystalDiskMark, were run using their default settings. Figure 1 shows the results from ATTO, while Crystal produced the results shown in Figure 2.

As you can see, particularly for the important 4k result, the results vary according to the

algorithm employed by the benchmark. As such, we note these results as a baseline for our testing, and look for performance changes relative to these values.

Next the same tests were run on the SSD. The ATTO results are shown in Figure 3. Note that ATTO automatically scales the bar graphs to fit the window, but the numerical value

### Welcome to the real world

All current storage disks (SSD and spindled) excel at streaming long files from the disk, but struggle with small ones. Windows has the unfortunate habit during normal operation of predominantly reading and writing small chunks of data to and from storage. The most common 'cluster size' is around 4k, which is the default for both FAT32 and NTFS, and the disk spends most of its time working out where to store the data rather than actually writing it. This is especially so for spindled disks. As such, a disk that can sustain a transfer speed of 150MB/s for long files but only 10MB/s for 4k transfers may actually perform worse than one that delivers a steady 50MB/s for all transfers, during normal computing.



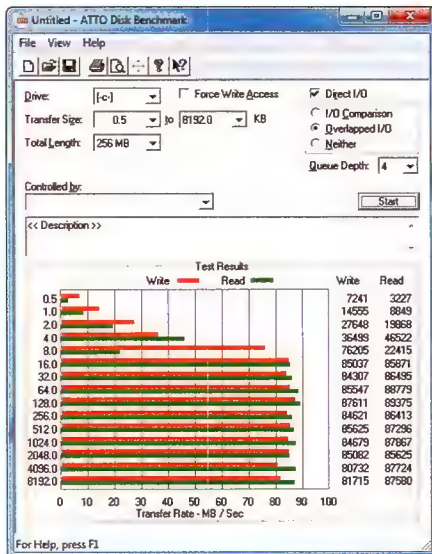


Figure 1 - Hard disk baseline using ATTO.

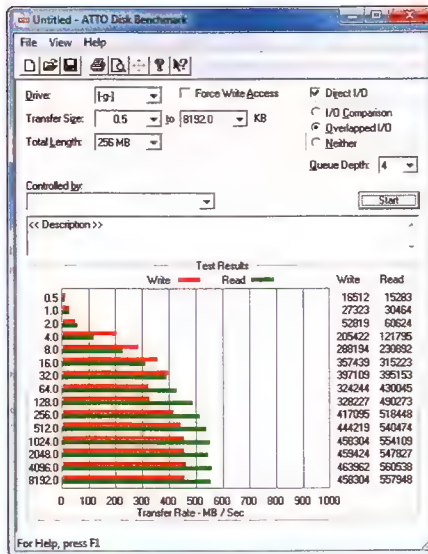


Figure 3 - SSD baseline using ATTO.



Figure 2 - Hard disk baseline using Crystal DiskMark.

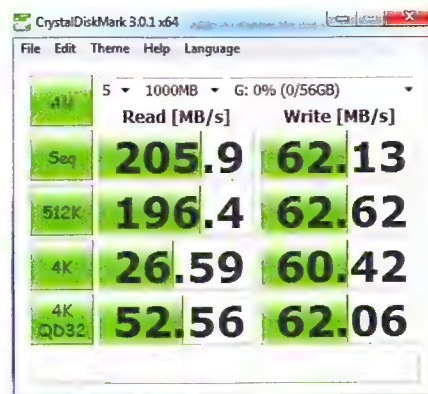


Figure 4 - SSD baseline using Crystal DiskMark.

(which is what we're focusing on) is displayed to the right of the graph. ATTO thinks the SSD can transfer over half a GB a second once it gets a long file to read! Awesome! Crystal formed its own opinion, as displayed in Figure 4.

Clearly the SSD has much better transfer rates at all workloads. The hard disk is outpaced in both baselines for small transfer, as well as large. As such, the small, nippy SSD should complement the large, but slow hard disk well.

So, how much does SRT improve the performance situation?

## Enabling SRT

Intel SRT is enabled after you have installed the OS. It requires that the SRT ROM be enabled in BIOS to do its magic. On my GIGABYTE board this setting is in the Integrated Peripherals settings, named "eXtreme Hard Drive (XHD)". Once enabled you will notice your hard disk(s) disappear from the normal POST drive listing. Another POST screen appears after the normal drive listing entitled "Intel Rapid Storage Technology - Option ROM" and your drives are listed there. They are now available for acceleration.

You should now install the latest version of

the Intel SRT software for Windows. Once you reboot and the dust settles you should see a new icon in your system tray which looks like a grey box. Note that the icon will have a spinning doughnut on it for a few minutes after you boot, as the SRT service is normally set to Delayed Start, and so will wait for a few minutes before it starts. When it changes to a tick you can double click the icon to start the SRT utility. You

## Where did Windows go? It was here a minute ago...

If you had previously installed Windows with SRT disabled, you may find the machine now does not boot. If this is the case it is because your drives were previously running in basic IDE mode, and Windows loaded drivers to use them in this mode. XHD mode is actually a derivative of the AHCI mode you may have seen in the past. This mode enables the drive to use more advanced features, including Native Command Queuing (NCQ), which allows it to perform more efficiently. It is usually recommended to enable this setting for Windows machines in all circumstances.

If your windows machine is unbootable at this time, restart the machine and disable XHD mode. Windows should then boot normally, and you should follow the instructions in the Microsoft knowledgebase article at <http://support.microsoft.com/kb/922976> to enable the Windows AHCI driver before rebooting and re-enabling the XHD setting in BIOS.

should see something similar to Figure 5.

Note the Accelerate button at the top of the window. SRT has detected that both hard disk and SSD are present in the system and it offers the accelerate option. Clicking this button will bring up a dialog box similar to Figure 6.

Read this dialog box carefully! First, the warning that it will erase everything on the SSD. If you have stored your favourite piccy of your pet monkey on the SSD, move it to alternative storage now (of course you've got multiple copies of it if it's so important...right?) Next, we note that you don't have to allocate the entire SSD to the cache. If you wish you can select to only use 18.6GB for SRT, and the rest of the drive can be formatted in Disk Management for use as a normal volume. Also note that SRT

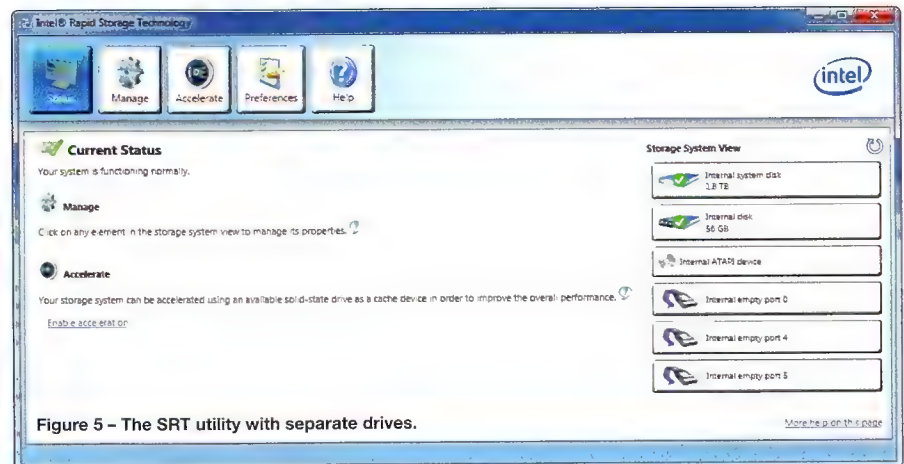


Figure 5 - The SRT utility with separate drives.



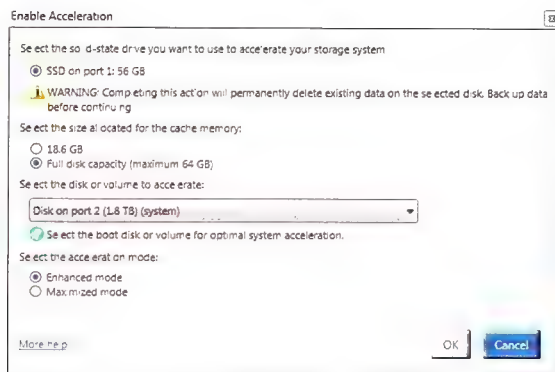


Figure 6 – Let's enable SRT acceleration!

can operate in one of two modes, Enhanced and Maximised. These specifically control the write mode of the cache:

## Enhanced

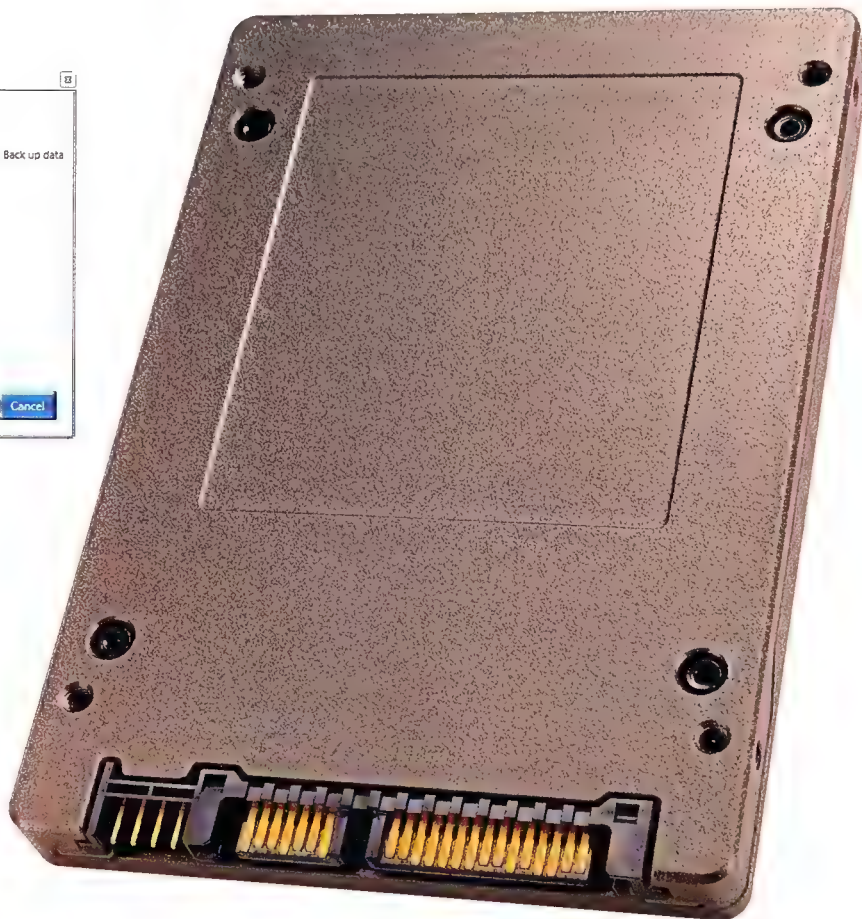
Traditionally known as **write-through**, this means the SSD cache is only used during read transfers. Writes hit the spinning disk directly and permanently. This is the safer option as all writes are committed to disk immediately (just in case a Bad Thing happens while you are saving your monkey pictures).

## Maximised

For those who like to live dangerously and want both reads and writes cached to SSD, this is the mode to choose. In this scenario the data is initially written to SSD and written back to the hard disk when time allows. This mode is traditionally known as **write-back**.

Once you have selected your preferred mode and confirmed your choice, SRT pauses for a minute while it prepares the SSD, and then logically links the HDD and SSD together. Once this is finished you will see the SRT window change to display something similar to Figure 7.

Now that SRT is enabled, let's test each mode and see what the difference between write-through and write-back actually means in terms of performance.



Once you have selected your preferred mode, SRT pauses while it prepares the SSD, and logically links the HDD and SSD together.

## Getting the numbers

Firstly, let's repeat the two earlier benchmarks using Enhanced mode acceleration. Once again, note that this is where only reads are accelerated, writes are unaffected. The ATTO results are displayed as Figure 8.

As expected it appears to make a huge difference on the reads, however the writes

are unchanged from the HDD baseline. Let's confirm this using the Crystal benchmark, as shown in Figure 9.

Once again, when compared to the DiskMark baseline for the HDD, the results are impressive: Intel SRT appears to greatly enhance read speeds! So, how does it fare when the gloves come off and we use Maximised (write-back) mode?

The ATTO benchmark (Figure 10) indicates a massive improvement on write speeds also. It indicates our hard disk is now performing around five times faster! DiskMark indicates a similar improvement, particularly with those all-important small transfers, shown in Figure 11.

It is interesting to note that the reported sequential (large file) write speed appears to be slowed by the cache in DiskMark, but accelerated when viewing the ATTO results. Again, this is most likely a function of the algorithms chosen by the two benchmarks. When using SRT it also appears to be more responsive when loading programs and moving data around.

Interestingly this technology appears to confuse the inbuilt Windows Experience Index utility. We had hoped to run the utility

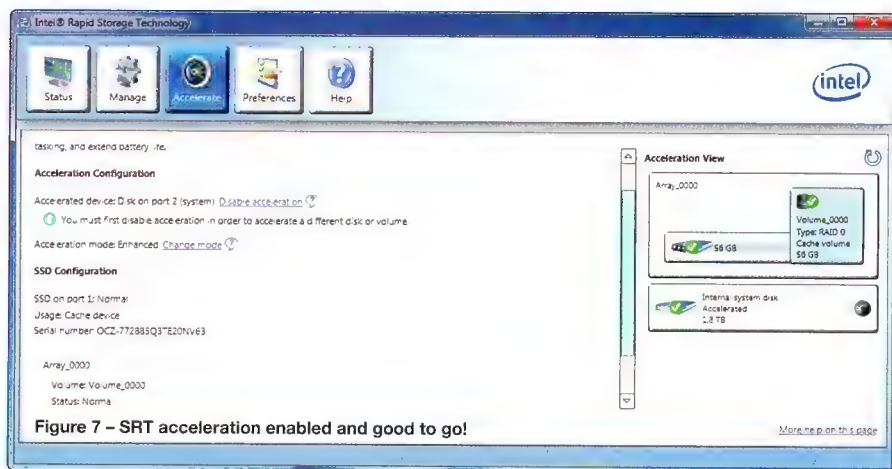


Figure 7 – SRT acceleration enabled and good to go!





## Sidestepping Z68

So, what if you don't have a Z68 'Sandy Bridge' based system? All is not lost, as Highpoint offers a RocketHybrid card. These PCIe x1 cards provide a similar functionality to SRT for under \$100. An excellent review is available on Tom's Hardware, at <http://www.tomshardware.com/reviews/rockethybrid-1220-ssd-caching,2936.html>

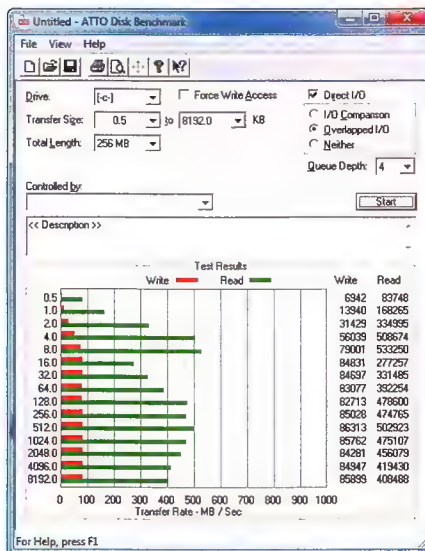


Figure 8 – ATTO results for SRT Enhanced mode caching.



Figure 9 – Crystal DiskMark results for Enhanced mode caching.

to show what Windows 'officially' thinks of the performance increases but it thought for a moment, and complained that it couldn't complete the test due to a 'driver issue'. Hmmm.

## Is SRT worth it?

So, Intel Smart Response Technology does appear to have a huge impact on hard disk access times and transfers speeds when enabled with a fast SSD. Both read and write speeds in each accelerated test do not exactly match the raw performance of the SSD, however. There is some software performance overhead in using SRT, in addition to the spindled hard disk, that make using a SSD in its native configuration the preferred choice for sheer performance.

After using the accelerated machine for a longer period we conclude that it isn't the same as raw SSD speed, but it is definitely an improvement for a relatively small outlay. It 'feels' like the system needs a little time to cache up the data every time you load something new. Once loading is underway, or the data you are after is already cached by the SSD, you can feel the acceleration taking place. Once you are settled into a game

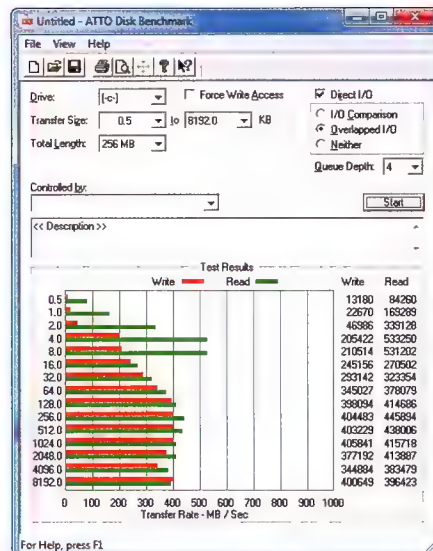


Figure 10 – ATTO results for SRT Maximised mode caching.

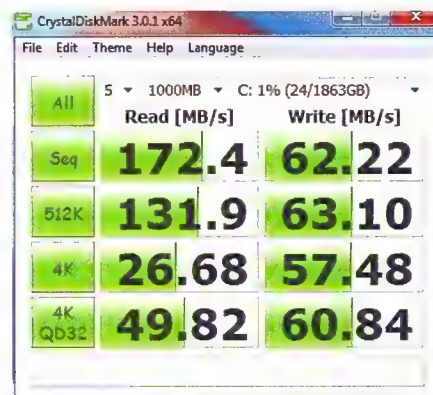


Figure 11 – Crystal DiskMark results for SRT Maximised mode caching.

or application it does appear to work well.

In conclusion, if you already have your machine just how you like it and are looking for a performance hit without huge expense or a reinstall, you may wish to consider Intel's Smart Response Technology. It is especially tempting when you consider you get it for free with Z68-based and future motherboards.

## A final word of warning

During the course of testing we found a disturbing problem when rebooting the machine. Once enabled, the machine ran well for testing, but when rebooted the SRT BIOS showed the acceleration as "Disabled". Even worse the machine did not boot! This appears to be a known problem on the Internet, and we found that an update to the latest version of the SRT software on the Intel website cured it. Reboots were fine after the newest version of the software. Always grab the latest SRT version people – you have been warned!



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# GAMEPLAY

GAMES, GAMING AND GEEKERY COVERED... ATOMIC-STYLE

**W**ow, what a busy issue. We've got so much gaming content that it can be hard to know where to start reading!

Luckily you've got this page to tell you. So start with our Skyrim tweaking guide, to customise everyone's favourite RPG with graphical and gameplay enhancements. Then read about how game storylines are evolving in our David Vs. Goliath feature.

Then take a small break and check out our multitude of game reviews and previews (after all, long-form can be tiring after a while!).

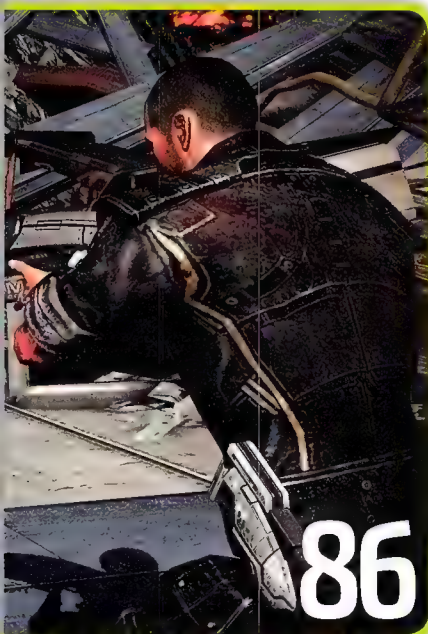
To wrap it all up, read our Engine Room on Mass Effect 3 – due to drop early this very year – and get some insight into what the hype is all about. And as per usual we finish off with Fallback. What more could you want?

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# SKYRIM

## TWEAK GUIDE

**Ashton Mills** applies his mighty tweaking mind to the intricacies of making Skyrim look and play as wonderfully as possible.

**R**egardless if you think Skyrim is pure awesome-sauce or merely a mildly entertaining distraction, one thing remains true: it's a Bethesda game, and it's tweakable and moddable from the tips of your frayed leather boots to that oddly placed and highly questionable ring jutting out of your furried ear. Part of the reason for this is that, despite Bethesda claiming otherwise in its pre-release marketing hype, Skyrim is not using a new engine. It's the same one from Oblivion, Fallout and New Vegas – just with a few extra bells and whistles thrown in.

But on the plus side this makes it familiar territory for tweaking and veritable playground for modding. In fact, there are so many mods just four weeks after release, even before the Construction Kit is out, that we decided to dedicate a separate guide to mods alone. Look out for that next issue.

For now, let's tweak!



# SKYRIM.INI AND SKYRIMPREFS.INI

The two files to work with are **Skyrim.ini** and **Skyrimprefs.ini**, which you'll find in your My Documents\My Games\Skyrim directory. Despite both files having similar sections, some settings only work if loaded from one or the other file.

These files contain a subset of the options you can play with – in total there are some 1400 lines in the full ini files, which you can see if you run **saveini** from the console in game and look in your Data directory. Be aware, however, that this file will take precedence over those in your My Games\Skyrim directory, and many of the settings are either detritus from previous games or have little or no impact on the game. The biggest differences can be seen with just a handful of tweaks, which we'll cover here.

We won't try and recommend different settings for different levels of hardware. Instead we'll start with an Ultra preset as this sets the widest range of settings for quality globally, and make note where relevant for highly taxing tweaks, then recommend ways to regain performance if necessary.

To begin, start the Skyrim Launcher, choose Options, and after auto-detecting click the Ultra preset and set Anisotropic filtering to 0 (no we're not crazy, read on). Quit to save your settings then make sure your NVIDIA or AMD driver's Anisotropic setting is forced to 16. The reason? Your driver does a better job at Anisotropic filtering than the game engine. For anti-aliasing settings it's more complicated – see *About those jaggies* over the page.

Next run the game to ensure all is well and, after loading a save or starting a new game, jump into the options and disable vibration and the 360 controller if you're not using one, as this can improve the mouse lag, and toggle y-axis inversion to your particular taste.

Now quit and head to your My Documents\My Games\Skyrim directory. Note that when adding or editing settings if a setting is used more than once in a file (which you might do if cutting and pasting settings around), we found

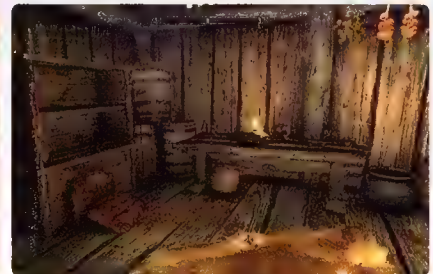
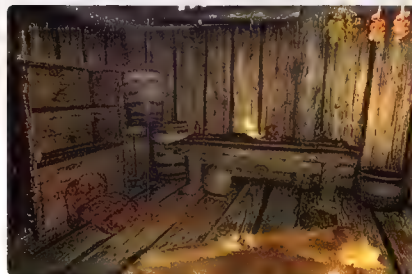
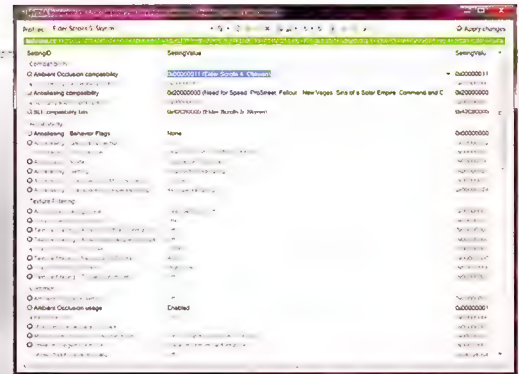
## Ambient occlusion

Ambient occlusion isn't new and, when used well, can add depth to an image (as we saw with Deus Ex: Human Revolution). It can also be brute forced on NVIDIA cards via the drivers, but this method is less elegant and often demanding.

Skyrim is no different, and while NVIDIA itself made much fanfare of the visual improvement AO makes for Skyrim, it neatly neglects to mention the performance hit.

If you want to try AO out, the easy way is make sure you've got the latest NVIDIA drivers and set Ambient Occlusion to 'Quality' in the NVIDIA control panel. You can also select 'Performance', but this has a habit of causing flickering in the shadows AO produces.

If you want to spend a little more time to improve the effect you can use NVIDIA Inspector and, in the Elder Scrolls 5: Skyrim profile, set Ambient Occlusion to 'High Quality'. This of course comes with a higher performance cost, but looks fantastic if you can run it. If your machine is struggling, there are also better AO profiles you can use – click 'Ambient Occlusion compatibility' and instead try out: 'Elder Scrolls 4: Oblivion', 'Call of Duty 6: Modern Warfare II' and 'Call of Duty 8: Modern Warfare III'. Each of these implements AO to different depths and range, and you'll likely find these other profiles not only better looking, but run considerably faster too. There isn't an equivalent for ATI/AMD cards at this time.



Skyrim will use *only the first instance* of a setting, and ignores subsequent values.

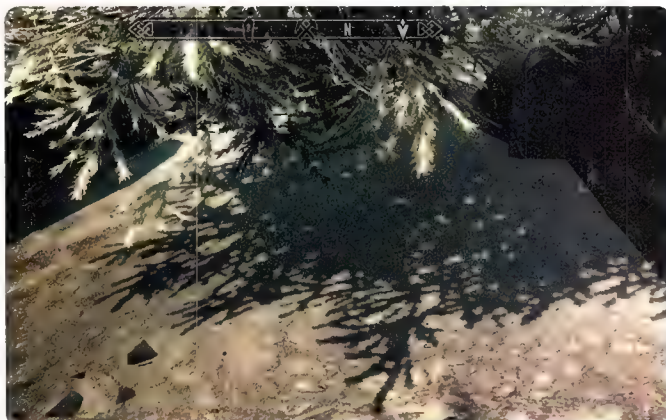
## SHADOWS

Let's start with the most obvious visual failing for Skyrim: those horrible shadows. Looking like they were rendered on a Commodore 64, it's clear this was the best attempt Bethesda could make to add dynamic Shadows to an almost decade-old engine. Unfortunately this means there's no silver bullet: the shadows

suck no matter what you do. However, there are some settings that can help.

**iShadowMapResolution** – Specify the overall detail of the shadow map. Higher is better, but more demanding too. Note while 8196 looks better than 4096, it causes major problems with interiors. Note: leave the 'Secondary' value on 2048, raising this is imperceptible for distant shadows but has a big performance impact.

**iBlurDeferredShadowMask** – This determines how smoothed the edge of a shadow



Shadow detail can be improved (right), at the loss of distant rendered shadows.



## About those jaggies...

Anti-aliasing is a must for any game and Skyrim is no different, but there's some debate over whether the game's multisample AA implementation is any good. We heard more than once that disabling the game's MSAA and using the driver version instead was faster – but this wasn't our experience. Forcing 4xMSAA or 8xMSAA on our NVIDIA system netted a drastic FPS drop compared to selecting the same MSAA level in the Skyrim Launcher. There is a difference however: while the game's MSAA looks just as good as driver forced MSAA to us, the game doesn't apply AA to items when browsing the menus, while driver-forced AA does. So it's a matter of preference what implementation you want to use, but as *both* can be applied at the same time, disable one or the other. Note that you can't force driver AA at all with NVIDIA unless you modify the NVIDIA Skyrim profile using a tool like NVIDIA Inspector at [www.guru3d.com](http://www.guru3d.com)

## Transparency AA

Skyrim doesn't perform transparency AA, and although an ini setting exists for it, the implementation is broken. Instead it's

best to use driver-based transparency AA, and it works well in conjunction with the game's own MSAA. To use it with NVIDIA leave the anti-alias override on 'Application Controlled', set transparency anti-aliasing to one of the supersampling levels, and use NVIDIA Inspector to modify the Elder Scrolls 5: Skyrim profile and change the anti-alias override field to 'None'. The equivalent for AMD users is to enable Adaptive AA in the Catalyst Control Center.

## FXAA

Skyrim also comes with that new-fangled shader-based AA known as FXAA (Fast Approximate Anti-Aliasing). As a shader it has a low overhead and is much kinder to your FPS than MSAA, while being roughly equivalent to 4xMSAA. However, it has a habit of 'blurring' the entire image, and this includes the interface.

It does have one advantage though: it also anti-aliases specular artifacts, and when combined with both MSAA and TSSAA can provide some truly stunning images. If you want to mix FXAA with driver-based AA modes see the Injectors section for utilising the latest FXAA version.

looks. Low values create sharp shadows, but with the poor shadow resolution to begin with, this makes them seem more pixelated. High values somewhat mitigate this effect, but detail is inevitably lost in the process.

**fShadowDistance** – This sets the exterior shadow distance. This is the setting that has the most impact: the lower it is, the less load on the PC, and the sharper the shadows appear. The trade-off is that lower values means shadows don't get rendered on distant objects.

**fShadowBiasScale** – As much a fix as a visual improvement, increasing to at least 0.4 fixes a bug with shadow shimmering on some objects while moving.

**bTreesReceiveShadows** – Like it says on the tin, trees now cast shadows on themselves. Adds an extra level of depth for minimal performance cost.

**bDrawLandShadows** – *Almost* as it says on the tin. In some cases rocks and other terrain appear to cast shadows on themselves, but it's hard to spot at the best of times. No harm enabling it, but not a necessary tweak.

Because shadows are a matter of taste, use the following recommended settings but change **iBlurDeferredShadowMask** to suit. The default value of 3 isn't a bad compromise, but try a value of 1 for sharper shadows or a value of 16 or higher for much softer shadows.

**Recommended: Skyrimprefs.ini**

[Display]

fShadowDistance=5000

fInteriorShadowDistance=2500

fShadowBiasScale=0.5000

iBlurDeferredShadowMask=3

iShadowMapResolutionSecondary=2048

iShadowMapResolutionPrimary=4096

iShadowMapResolution=4096

bTreesReceiveShadows=1



## LIGHTING

As with shadows, lighting effects trail off with distance. During the day you don't notice this much while outside, but at night extending, the distance allows you to see the warm lights of a town off in the distance. It also improves lighting range (reduces pop-in) and effects in dungeons dramatically.

**f..LODStartFade** – As it says, the range at which the specified effect will start to fade out.

**Recommended: Skyrimprefs.ini**

[Display]

fSpecularLODStartFade=8000

fLightLODStartFade=12000

There's also the another tweakable option, the **fShadowLODStartFade** setting, but we didn't notice any effect given the shadow management above. Feel free to tweak with it.

## SHADOW SUN MOVEMENT

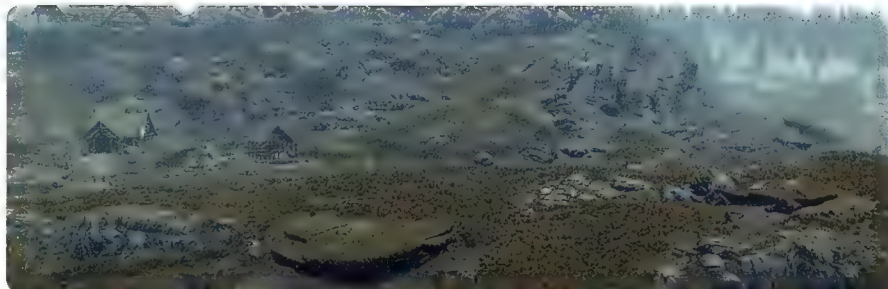
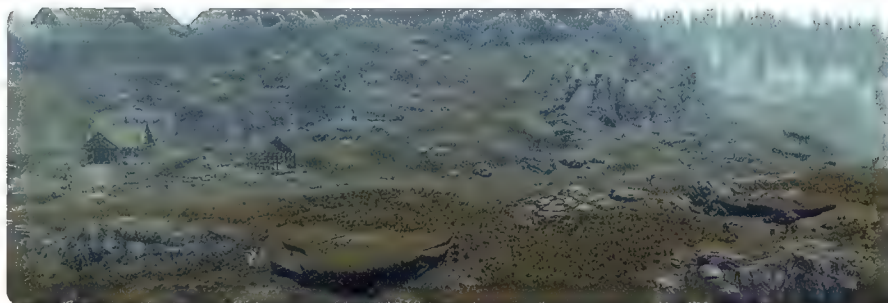
Once you've got the shadows looking somewhat better there's yet another shadow problem to fix. You may have noticed that the dynamic time of day is nice and all, but shadows cast by terrain, objects and people have a habit of 'jittering' rapidly as the shadows move, which can be jarring. After all, there's nothing more immersion-breaking than glitches like this. Fortunately, just two settings control this behaviour:



## Keeping the interval

The game forces vsync by default via the **iPresetInterval** setting. For those users who prefer vsync off, Skyrim is one game you might need to learn to love with it on. Disabling vsync has been shown to cause a wide range of problems, from borked physics to movement issues and broken quests. For better or worse, the in-game timers depend greatly on the frequency of screen updates.

Naturally, if you're using vsync you should always use triple buffering to ensure smooth frames. Set triple buffering in your driver's settings and use a third-party tool like **D3DOverride** to ensure it's applied.



**fSunShadowUpdateTime** – The period over which an updating shadow animates. Unfortunately, fast updates cause shimmering, and slow updates look jerky. Best disabled.

**fSunUpdateThreshold** – The period after which an update occurs. Too high and the jumps become noticeable, too low and you'll see them stuttering.

**Recommended: Skyrim.ini**

**[Display]**

**fSunShadowUpdateTime=0.0**

**fSunUpdateThreshold=0.5**

## GRIDS

The **uGrids** setting has been with us for many Bethesda games, and determines the number of 'grids' around the player that replaces placeholder data with loaded cells. A loaded cell not only renders the detail on objects, but also loads NPCs, creatures and more.

**uGridsToLoad** – This is the single biggest visual change you can make, and the most demanding. A setting of 11 provides beautiful distant views, but FPS is sure to nosedive. There have been many reports of game instability on a setting any larger than 9. Default is 5.

**uExteriorCellBuffer** – Works hand in hand with **uGridsToLoad**, and is best set at  $(uGridsToLoad + 1) \wedge 2$ .

In previous guides it was also recommended to set the **iPreloadSizeLimit** to a higher value, but in Skyrim high values have been shown to cause instability. It's best to let Skyrim manage this one by itself.

**Recommended: Skyrim.ini**

**[Gameplay]**

**uGridsToLoad=7**

**uExteriorCellBuffer=64**

**Warning:** If a game is saved with a high **uGridsToLoad** value and then you change it to a low value, the savegame won't load. Test this setting on a separate save and make sure you're happy with the performance impact before using it. If you need to recover a save, first load the game with the **uGrids** setting you are using, bring down the console, type **setini "ugridstoload:general" 5** followed by **saveini** and **refreshini**, then save the game.

## GRASS

Grass distance and density is easy to play with via the ini files and, if you're using a larger **uGrids**, can help flesh out mid-distance terrain. (Cont'd over)



The **uGridsToLoad** setting is the most visually stunning change you can make, and the most demanding.





Flesh out the detail of distant mountains.



**fGrassStartFadeDistance** – Sets the distance before which grass fades. There's actually three grass fade settings, but you only need to set this one. At a high distance, fading out isn't necessary.

**iMinGrassSize** – Sets the density of the grass. Defaults to 20, lower values have no effect, while higher values will thin out grass. This one only takes effect in Skyrim.ini, and is best left alone.

**Recommended: Skyrimprefs.ini**

[Grass]

fGrassMaxStartFadeDistance=14000

## A different point of view

If the field of view is feeling cramped, that's because it is. Change the default of 65 to a higher value such as 80 or 85 for wide-screen monitors. As Skyrim has a habit of resetting the FOV when transitioning, the common wisdom is to use a brute force approach to ensure it sticks. First set the following:

**Skyrim.ini:**

[Display]

fDefault1stPersonFOV=80

fDefaultWorldFOV=80

fDefaultFOV=80

Then load your game, press ~ to bring up the console, and type: **fov 80**. Close the console and save your game.

## TREES, MOUNTAINS AND CLOUDS

Another large contributor to distant detail are trees, mountains and clouds. All of these can be extended in view for sometimes stunning vistas. By default on Ultra settings, all of these are set at pretty decent distances. The following settings allow you to squeeze the absolute maximum out of your distant detail, but the actual differences are subtle.

**fTreeLoadDistance** – How far trees are rendered. This is perhaps the most obvious of these tweaks, revealing trees on distant mountains.

**fMeshLODLevel..FadeTreeDistance** – Affects only trees rendered on unloaded grids. Roughly doubles the level of detail, adding more branches. Another change you can see fairly often when looking into adjacent grids.

**fSkyCellRefFadeDistance** – How far clouds are rendered around mountains. A simple change that adds a little more depth to distant vistas, and is well worth changing.

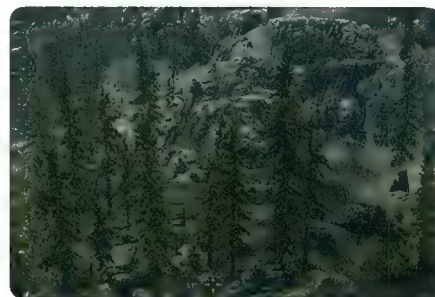
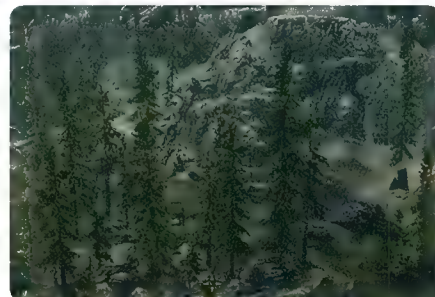
**fBlock..Distance** – Three settings that change the level of detail on very distant terrain and mountains. Of these tweaks, this is the hardest to notice, but will give your artistic screenshots that extra depth. Probably not worth it for general gameplay.

**Recommended: Skyrimprefs.ini**

[Tree Complexity]

fTreeLoadDistance=150000

fBlockMaximumDistance=500000



Adding detail to trees in unloaded grids.

fBlockLevel1Distance=350000

fBlockLevel0Distance=200000

[Terrain]

fMeshLODLevel2FadeTreeDistance=15000.0000

fMeshLODLevel1FadeTreeDistance=15000.0000

[Cloud Rendering]

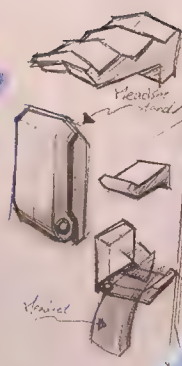
fSkyCellRefFadeDistance=300000



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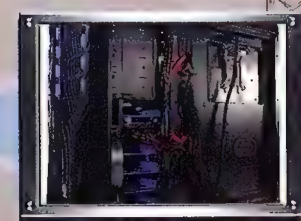
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## Keeping an eye on VMEM

Skyrim typically runs well on GPUs with 1GB of VMEM. If you start playing with settings that extend visual distance, increase uGrids, or start adding texture mods you can start running out of video memory, causing a dramatic loss of FPS.

Further keep in mind running in high resolutions, enabling anti-aliasing, and forcing triple buffering will also eat up onboard video memory. So as you tweak, keep an eye on your VMEM usage. Cards with 1.5GB or more should be able to get away with maximising everything (at least until you start adding texture mods!).

By way of example:

- 2560x1600, uGrids 7, 4xMSAA+4xTSSAA, Triple Buffering, Ultra preset = **1513MB**
- 1920x1200, uGrids 5, 2xMSAA+2xTSSAA, Ultra preset = **976MB**

## WATER

The water is pretty impressive in Skyrim, and as with previous games there are a few tweaks you can use with it.

**iWaterReflect...** – Sets the quality of reflections from water. There are a number of other water-based settings, but none of them appear to have any noticeable effect.

### Recommended: Skyrimprefs.ini

[Water]

iWaterReflectHeight=1024

iWaterReflectWidth=1024

## ARCHERY FIXES

Archery is fun in Skyrim but there are a couple of problems with it. Firstly, arrows seem to launch above the actual bow, shooting targets far away has no effect, and console 'auto-aim' magnetism targets for you in combat; it's too easy. The latter can't be fixed with ini tweaks

but may be fixable when the Construction Kit is released. The first two, however, can be greatly improved via the inis.

**f..ArrowTiltUpAngle** – Controls the initial angle the arrow appears to launch from relative to the bow.

**fVisibleNavmeshMoveDist** – While it's primary purpose probably isn't in helping archery ranges, raising this value allows NPCs and creatures to be hit at much greater distances.

### Recommended: Skyrim.ini

[Archery Combat]

f1PArrowTiltUpAngle=0.7

f3PArrowTiltUpAngle=0.7

[NPC/Creature Damage]

fVisibleNavmeshMoveDist=140000

Another popular value for the arrow tilt angle is 1.2, so play with both and use the one you like the most.

## OTHER TWEAKS

Finally here's a range of smaller but useful tweaks. Suit to taste. If the setting or [Heading] isn't already present, add it.

- **Remove the intro logo** – Skyrim.ini, under [General], add **sIntroSequence=** and leave it blank.
- **Disable mouse acceleration** – Skyrim.ini, under [Controls], set **bMouseAcceleration=0**, also helps to reduce mouse lag.
- **Change the encumbered timer** – Skyrim.ini, under [General], **fEncumberedReminderTimer[value]**, measured in seconds. Set how frequently the game bugs you about being overencumbered, defaults to 30.
- **Speed up books** – Skyrim.ini, under [Interface], **fBookOpenTime=250** to accelerate book open and close animations.

## Large Address Aware(ness)

The Skyrim community discovered early on that altering the **Skyrim.exe** file to be LAA, or Large Address Aware, fixed whole swathes of CTDs and stability problems. Bethesda hasn't acknowledged there's an issue with Skyrim's memory management, but the hordes of users who went from frequent crashes every ten minutes, to hours of seamless gameplay, attest the benefits LAA provides.

And at the time of writing, after much lobbying, Bethesda has announced it's investigating making Skyrim LAA by default in the next patch (which you should have by the time you read this), so third-party LAA enablers should no longer be required.



Using an FXAA injector with sharpening and tonemap properties can greatly enhance the game.



- **Zoomier items** – Skyrim.ini, under [Interface], **fInventory3DItemZoomScale=3** to get an even *closer* look at your sexy gear.
- **Faster switching** – Skyrim.ini, under [Camera], add **fMouseWheelZoomSpeed=2** and **fMouseWheelZoomIncrement=0.0550** to accelerate switching between 1st and 3rd person and zoom faster with the mouse-wheel. Handy for combat.
- **GIVE ME MOAR MAGICS!** – Skyrimprefs.ini, under [Particles], set **iMaxDesired=1000** to increase by 25% the maximum number of particle effects used by fire and spells.
- **Disable the compass** – Skyrimprefs.ini, under [Interface], set **bShowCompass=0**.
- **Disable quest markers** – Skyrimprefs.ini, under [Gameplay], set **bShowFloatingQuestMarkers=0** and **bShowQuestMarkers=0**.

## Reclaiming performance

As these tweaks start with an ultra profile in order to set the widest range of default values, if your machine is struggling for FPS, here are the settings you should adjust in order:

- **Don't use AO** – Probably the most obvious, but even if you like the effect, Ambient Occlusion is a huge performance hit.
- **Reduce uGrids** – Returns uGridsToLoad to 5 if you raised it.
- **Reduce AA level** – Reduces your MSAA level and TSSAA level. The engine appears to not be very efficient for high AA levels so if using 8xMSAA, reduce to 4xMSAA or less.
- **Distant object detail** – In the Skyrim Launcher options, reduce this from 'Ultra' to 'High' or lower.


- **Distant object fade** – Ticking this box in the Skyrim Launcher grants a small boost to FPS with negligible visual difference. It's not huge, but it's something.
- **Lower shadow distance and map** – As covered earlier, lowering the shadow distance not only improves shadow quality, but also boosts FPS. If our recommendation of 5000 is too demanding, try 3000. Also reduce the shadowmap from 4096 to 2048.
- **Reduce quality sliders** – From the Skyrim Launcher lower the 'Ultra' settings to 'High' and reduce the maximum ranges for features like actor distance.
- **Use an injector** – Use an FXAA injector in place of all game or driver-based AA. Disabling AA will give a noticeable boost, while FXAA with sharpening can still provide excellent visual quality.

## INJECTORS

This final section is a bit of a segue to mods through the use of DirectX DLL injectors. The darling of the moment is the FXAA injector, based on the work of an NVIDIA engineer by the name of Timothy Lottes. The injector itself was written by another programmer, is simple to install (literally just copy it to the binary directory of the game), and has evolved to do a lot more than just smooth jagged edges: the latest injector can apply sharpening, tonemaps, saturation and more to an image via the GPU shaders (pictured far left, opposite).

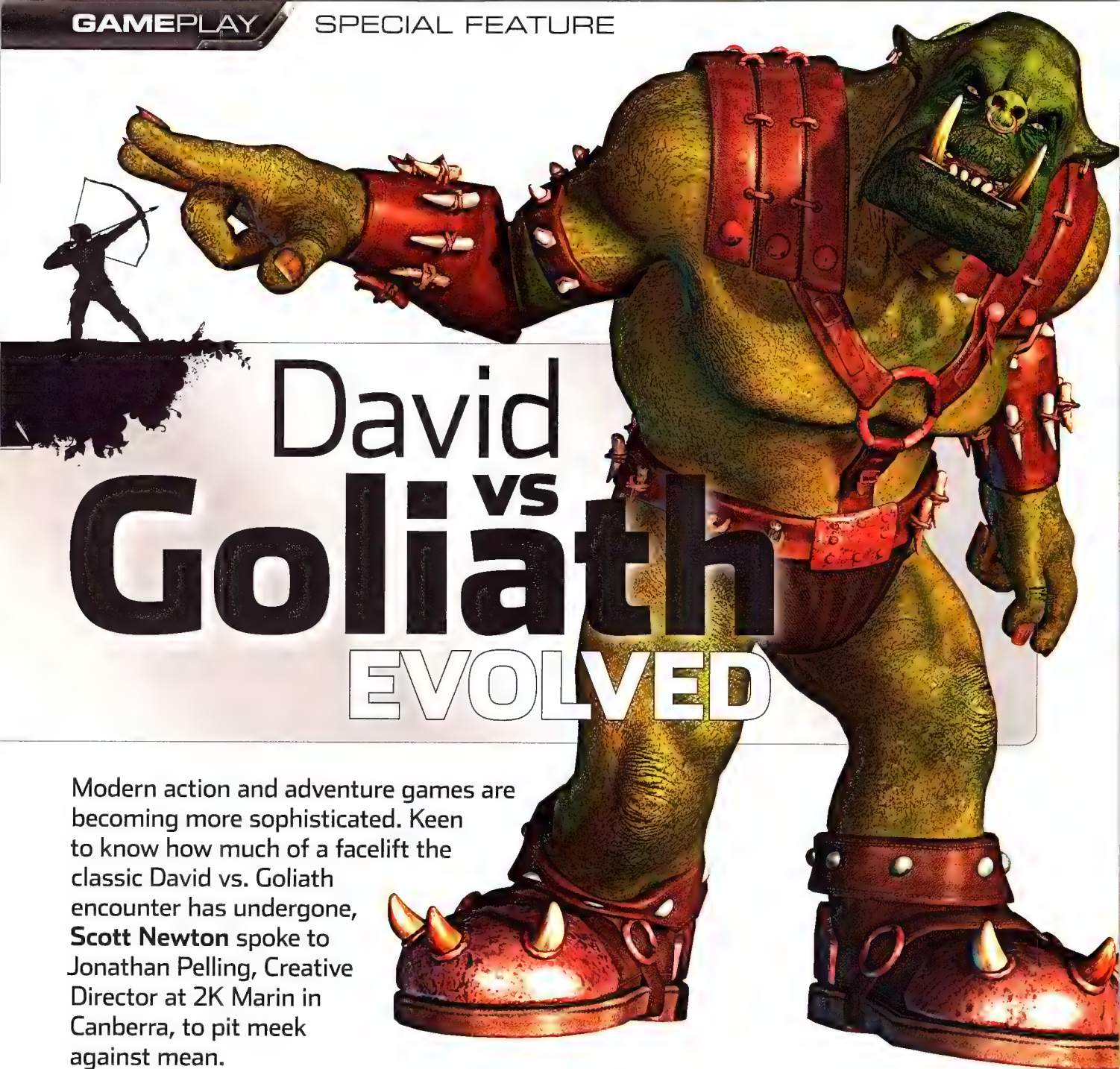
To this end there are *loads* of FXAA injectors on Skyrim Nexus ([www.skyrimnexus.com](http://www.skyrimnexus.com)) that users have uploaded with their own personal settings. Some are garish, some are superb. It's best to browse them yourself and choose one that suits you.

Note that as FXAA also removes jaggies, you can usually afford to tone down your AA settings and gain some performance too. Try using just 2x MSAA and TSSAA with an injector for excellent visuals with minimal FPS drop.

Next issue we've literally sorted through over 2000 Skyrim mods to bring you the best modding guide in all of Tamriel! Roll on #134. 







# David vs Goliath

## EVOLVED

Modern action and adventure games are becoming more sophisticated. Keen to know how much of a facelift the classic David vs. Goliath encounter has undergone, **Scott Newton** spoke to Jonathan Pelling, Creative Director at 2K Marin in Canberra, to pit meek against mean.

**H**ere's the scene: You're a callow youth, staring across the plain of battle at lines of soldiers that crisscross behind one another like rows of shark teeth. Standing in the front line is a tree of a man; a tower of muscle and bone. His armour is a knit of bronze scales and his spear looks fit to skewer a lion. Your brow is smeared with a crown of perspiration as your legs carry you forward to confront him...

In one way or another, this template has been played out in games for over 25 years. In film, it's seen decades and in literature, centuries. Why? Because it's a compelling idea that an underdog can win out with little more than his courage and wits.

This is gaming in one of its most raw and simple forms, and it can hold great appeal if the A.I. is up to scratch. But when we employ the

subtle processes of human thought against our artificial foes, they are often outmatched.

So when we are set down in these worlds, what do developers do to make our lives tougher and what are they willing to arm us with; what is our equivalent of David's slingshot?

### Right from word go

"There are two threads to this," says Jonathan. "One is an aspect of design where you want to create a curve that allows the player to grow and increase in their abilities as the story unfolds. On the narrative front however, it can be economical to set a character on the back foot immediately — to have them confronted by adversity and be fairly powerless." The idea behind this is that it builds resolve in a

player because it's not in our nature to give up at the outset of an adventure. Beginning a game imprisoned, as in the **The Elder Scrolls: Oblivion**, or to begin as an outcast or an orphan; such are good cradles for David. From standpoints like these, a player can be introduced to a world, almost as a newborn (or literally as a newborn in **Fallout 3**). Learning how to survive from the ground up is typical. A player needs to understand the mechanics of encounter and combat before they face real adversity. Thus, says Jonathan, "You begin by fighting grunts — then faster grunts — then grunts with helmets or better armour etc., before going on to face lieutenants." Good design makes a player evolve new strategies. Singular AI can react to certain situations and vary certain behaviour, but to keep a player



guessing, designers use varied enemies with different weapons and different approaches. If these are used in concert, the player can be stretched. The game **Borderlands** is an example of where you get a fair mix of foes. So is **Modern Warfare 3**, where enemies simulate human behaviour surprisingly well. If you can be flanked or 'waited out' by a sniper or driven from your hiding spot by grenades, then you've got yourself a real game of chess.

As Jonathan points out, a player, having now developed a pool of expertise, will then be confronted by a situation (classically a boss character) where this accumulated knowledge and skill can be put to the test, be it with firearms or fireballs. And if you are tossing around fireballs or projecting bolts of frost then you have a lot more in common with David than you might suspect. David, like a mage, is your

sandbox games have always sought to do this, but he says, "We are seeing more customisation in shooters and we are seeing an overlap in genres." **The Mass Effect** series, for example, offers the player many different traditionally-RPG mantles and abilities to choose from, despite being a shooter insofar as its fighting mechanics and weaponry are concerned.

In the recently-released Elder Scrolls game, **Skyrim**, Bethesda says that players won't even be locked into career paths. The game will take note of how you are playing; what spells or weapons you wield; whether you're using stealth or perhaps even diplomacy to solve quests and it will fortify skills accordingly, thus creating a character unique to the player. Skyrim also boasts a new story management system called 'Radiant Story' which makes

AI can react to certain situations and behaviour, but to keep a player guessing, designers use varied enemies with different approaches.

classic glass cannon. He's able to land a killing shot from a distance, but if he gets too close to his foe he's going to get shattered. This is why David forgoes armour, so that he can remain agile and attack from afar.

## Realer than real

So as games add more detail, as environments become more challenging, and as programmers seek to give their NPCs the wherewithal to adapt, what is the player being given? "Well, for a start," says Jonathan, "A high degree of customisation." RPGs and

encounters less arbitrary. That a player's destiny is not manifest, but *made*, is incredible.

## Freedom of choice

Beyond such innovations, players can actually choose (or appear) to be more fragile. Pointedly, guys who play female characters do so not just because they are prettier to watch for hours on end; rather, it gives a sense of vulnerability. The psychology is quite simple: you can raise your sense of tension by playing a gender you perceive as weaker or that you have an innate wish to protect.







This is an idea that Toby Gard, the creator of Lara Croft, brought to the masses in 1996 with the **Tomb Raider** series. Brutish male characters were the norm at the time, but Lara showed us there was more than one way to skin a cat. The idea that silky athleticism and nimble-footed gunplay could be employed to despatch foes made Lara a modern-day David. Importantly, she also had intelligence, which helps

human," and "vulnerable of real, painful injury."

It's hard to care for a character that is without frailty. This is why gamers will get a freshly-minted look at Lara's young life and why they'll see her put on the defensive this time around. "We need to put her in a place where she is stripped of resources and she's forced to react to that situation," imparted Longo.

## Resource crisis

This stripping of resources is pivotal when building tension and vulnerability. Indeed the

**CAPCOM made Jill Valentine weaker than her counterpart, Chris Redfield. They gave her more ammo and items. Who would you rather play?**

if you're confronted by fiendish puzzles. Of course it didn't hurt that she had a huge rack... err, of weapons to choose from.

## One tough cookie

Ironically, one of the problems confronting Crystal Dynamics, tasked with creating Lara's newest adventure, was that after 15 years she had become, in a way, bulletproof! Her inner strength, her imagery, her movies and iconography had developed such steel that she'd become superhuman. This is why they chose an origins story to reboot the **Tomb Raider** franchise, a story where Lara was still young and inexperienced. "What dropped away pretty quickly was the hardness that she had," said Art Director Brian Horton when discussing the new Lara with game journalist, Megan Marie. The studio wanted "...to try and soften Lara up enough so that you could step into her life," concurred Franchise Director, Tim Longo Jr, saying that they wanted Lara, "Capable, but

survival horror genre holds a set of keys that each unlocks a fear. Such games strip you of companions, physically isolate you, place you in semi-darkness, starve you of ammunition for your standard-issue pistol, and fill the air with haunting sounds and eerie scores. It's enough to get a noob mashing buttons at the sound of a creaky floorboard. One of the most iconic characters in this genre is, again, a woman. When CAPCOM made the original **Resident Evil** they specifically made Jill Valentine weaker than her male counterpart, Chris Redfield. To offset this they gave her more ammo and two extra item slots. Who would you rather play? Now beyond the hulking archetypes, Jonathan points out that Goliath can take more subtle forms. He cites **Bioshock**, a game where he did level design. "It's been said before that 'Rapture' (the underwater world) is the main antagonist in **Bioshock** because it has its own journey, and a personality that comes through the aural landscape as well as the aesthetics of





the place. And you learn more about Rapture than you do about any character, including your own," says Jonathan. In **Bioshock 2** there's an added dimension, in that you bear not only the weight of the ocean as you walk the sea floor, but the weight of partnership! Few games have you paired as David *and* Goliath, but this one does. You're a Big Daddy, a genetic freak inside a diving suit; a brass cage of sorts (incidentally, Goliath wore brass armour), and you are tasked with protecting Little Sisters, young girls with no defences. Another game harnessing the pathos of partnership is **The Last Guardian**, set for release in 2012. In this game you will play as a young boy. Your protector will be a huge Griffin-like creature whom you'll come to bond with and perhaps, even love.

## Nuclear aspirations

Jonathan says games with post-apocalyptic settings are sublime if you're looking to exploit the fragile. "When we see the decay of beauty, we despair," says Jonathan. "It's powerful imagery." A good example of this is **Fallout 3**, and **Fallout New Vegas** – worlds where starvation, dehydration and radiation can actually kill your character. And yet we return time and time again to those worlds. He continues: "If a world, however fantastic, has rules and history and depth – if it has life to it – then the player can be compelled to return." Complex, layered stories like **Fallout** and **Bioshock** are becoming more common. In some ways we are seeing a type of 'game



literature' evolve, and the games that are boldly going in this direction are creating smart antagonists. "We are creating adversaries with relatable intentions or ideals," says Jonathan. "We are seeing foes, no matter how alien, that challenge preconceived notions of whom or what they are. And we're asking what it is that makes them enigmatic or interesting." Games can even sow the seeds of doubt in the player's mind about whether to completely destroy a foe or not. "The player may get to a point in which he or she questions their moral standpoint," says Jonathan.

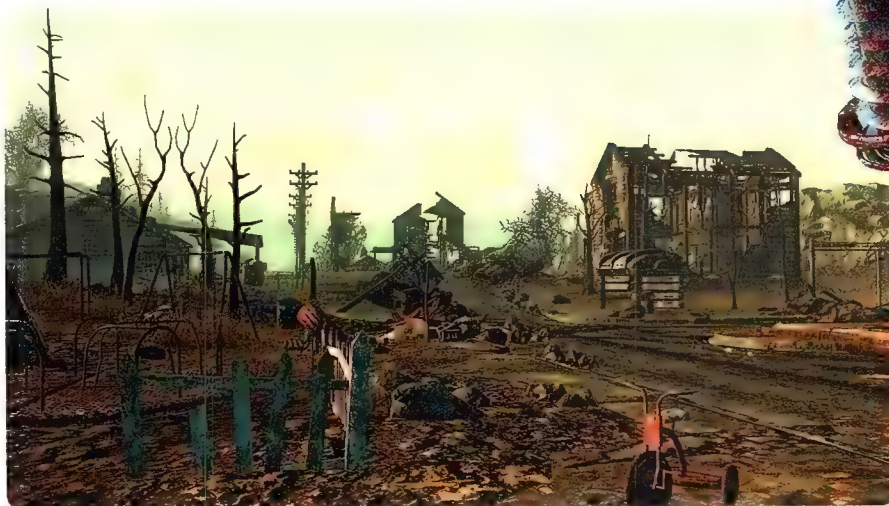
## Judge and jury

Films can pose moral dilemmas and the viewer can process these in an osmotic way, but games can place a real physical demand upon a player and ask an individual to commit to an emotional outcome of their own choosing. This is something a film cannot do.

Jonathan cites **Shadow of the Colossus** as an emotional landmark game. "Here you are hunting down magnificent, majestic creatures to fulfil a goal that is, ultimately, selfish," he says. Reading

the forums on this game, many players felt conflicted by this. In *SotC*, the player was the one casting a great shadow over the experience and as the Colossi fell, you couldn't help but feel that you had begun to wear Goliath's skin. This minimalist game shows us that countless lines of dialogue are not a requirement in garnering an emotional response. A haunting score, an open world, enigmatic foes and an unspoken request to harden your heart for personal gain; these were its chords.

When gaming first began, players were rewarded with shiny coins or points for their efforts. Now progressive games are seeking to reward the player with something extrinsic, such as a better understanding of valour or sacrifice. Dare we say that gaming is attempting to convey something Davidian, something that can be carried beyond the confines of the screen?





HOW THEY MAKE

# MASS EFFECT



You know the name and you know the stakes. Nathan Lawrence takes an exclusive behind-the-scenes look at a group of the key minds behind the most anticipated RPG of 2012.

**Y**ou don't have to look too hard online to see how much pressure is riding on BioWare to deliver a satisfying conclusion to its Commander Shepard story arc in the Mass Effect universe. Entire websites muse over individual desired narrative outcomes, with pages dedicated to predictive fan fiction. Forums hold hundreds of pages of regularly updated wish lists for features and alterations that are debated and ranked as to their generally accepted validity. And even critics have applied the **Cracked.com** formula to headlines, citing 'X things that Mass Effect 3 needs'. You may have spied a similarly themed article by our very own David Hollingworth, [www.atomicmpc.com.au/?278830](http://www.atomicmpc.com.au/?278830).

There's never really been a series like Mass Effect that links together different yet seemingly personalised narratives from game to game to game. A lot of big promises have been made about what to expect from Mass Effect 3, but most of what's been divulged to date revolves around improved combat and the divisive decision to include multiplayer. But that's not what the core game is really about. At its core, Mass Effect is a sprawling sci-fi opera with heart, a compelling narrative, interconnected storyline and strong, believable characters. We cut open Mass Effect 3 and took a look at its heart to confirm that it still has the required strength and character of Phar Lap to get the Commander Shepard narrative across the line one more time.

## Here be Reapers

The Reapers have landed and Earth will fall. This is the underlying certainty that will drive you forward as Commander Shepard in Mass Effect

3. We got hands-on with the first hour and a half of Mass Effect 3 and relished the opportunity to play the all-important single-player component for longer than a spin around the block. Not wanting to waste any precious time, we selected the default male Shepard appearance, flicked the difficulty to hard and chose Vanguard class, as it had been singled out as one of the classes that had been improved upon.

## Exfiltrate Earth

The intro introduced some new and familiar characters along with what was at stake, but Mass Effect 3 wasted little time in cinematic exposition before thrusting us straight into the thick of it. A towering war machine explosively disrupted the anti-Reaper planning session,

forcing Shepard and Admiral David Anderson to hightail it out of there. Ammo was sparse and enemies were plenty in this opening level, which acted as a refamiliarisation of all the essentials and offered some resounding examples of what you were fighting for and why time was of the essence.

After being reinstated as Commander by Anderson, the Admiral opted to stay on Earth to lead humanity's seemingly hopeless fight against the Reapers. No pressure, but it will be up to you to amass an army to combat the fast-spreading Reaper threat. Our first and only stop post-Earth in the demo was Mars. The supposedly friendly colony on the red planet was overrun with dastardly Cerberus troops, hell-bent on stopping our mission towards essential data held in the







central mainframe.

Weapon benches allowed us to bolt collected upgrades onto our arsenal, where we pimped out our shotgun (of course) and boosted the power of the already head-removing sniper rifle. The powers were as deadly as ever and – considering that creative director Preston Watamaniuk cryptically promised that almost every power can combo with at least one other – worked even better in conjunction with squad mates. We had deadly Ashley and newcomer James Vega watching our backs, who held their own and were skilled at providing effective support, even when we mixed up our play style.

The demo concluded with a chase sequence that ended with Vega ramming a ship into a fleeing vessel, poor Ashley being brutally incapacitated, and a slow-motion gunning down of the enemy operative as she sought to rip our throats out. Sufficiently impressed with what we had played and craving a whole lot more, we moved on to the BioWare kitchen to pick the brains of the chefs behind the product.

## Get your arse to Mars

Derek Watts, art director on the Mass Effect series, had the following to say while we discussed the issue of finding the sweet spot between sci-fi homage and flat out cliché. "We're in science-fiction to do some of those clichés, and a lot of stuff that we've seen in

movies before. That's the great thing about going to Mars: you've seen it in so many other movies and you're like, 'Shit, now let's go there, too.' Or like, 'I wanna go there, let's do our take on Mars and let's do our spaceship and let's have fun with that.'"

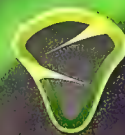
Derek expanded on this point further in how he deals with his concept artists. "I always tell the concept artist, 'never be too afraid of the clichés, we'll just take them in a new direction. They're there for a reason. I mean, they are iconic and they do help reinforce characters. Like, the troopers have the angled eyes to make them look angry. I mean, they can't have the happy face and all of a sudden they come out and start murdering you as well. Y'know, we put the glowing eyes on and it's cliché in science-fiction especially, but it's public domain. Nobody owns it.'"

## Wartime inspiration

When we sat down with Parish Ley, lead animator on the Mass Effect series, to discuss where he seeks inspiration, he mentioned a range of sources external to the science-fiction genre. "For Mass Effect 3, we're looking at a lot of war photography, war movies, literature. We're kind of drawing from a lot of war imagery, a lot of photography, and then also the classic war movies as well. For Mass Effect 2 we drew a lot more from the Dirty Dozen. What you'd see

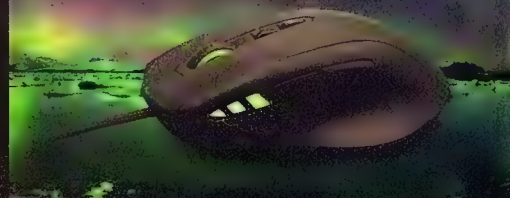


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in Mass Effect 2 is a lot of camera compositions where the team is all included. With Mass Effect 3, we're going a little bit more towards, say, a general-type of imagery. You'll see Shepard sometimes more isolated in frame, to give the idea of the burden of leadership, the weight of trying to save the galaxy is on this one guy and what that kind of means."

And when you're tackling the complex narrative demands of the Mass Effect series,

the developers track the many twists and turns of the narrative along with the seemingly endless alternate plot points that change from player to player, depending on their choices in the first two games. Mac Walter, lead writer on the Mass Effect franchise, talked us through the tools, highlighting the complexity of the writing team's job by filling a screen with variables relating to a single plot decision in Mass Effect 2.

Suffice it to say, we were intimidated.

**"You'll see Shepard more isolated in frame, the idea of the burden of leadership, the weight of trying to save the galaxy on this one guy"**

everything has to come back to storytelling. For Parish, his work in animation has a huge role in carrying the story forward. "We tell stories through the people that you interact with. Because only in knowing those people can you understand the world. We can have a very dry, y'know, this is what happens in the universe, this is the science behind it; but if you don't have people there to attach to those things, it's just empty words to a certain degree. So making those personal relationships work is really one of our big marching orders."

## Loving the player

During our studio tour we got to visit the Mass Effect writing room: the place where all of the characters, plots and, intimidatingly, the ever-expanding narrative variables are carefully tracked. BioWare uses a number of tools to help



Considering how important the overarching narrative is in the Mass Effect series, we were keen to pick Mac's brain about how he approached various challenges with save games being carried forward from two previous games. His response was inspiring. "We knew that we wanted to involve the key characters in Mass Effect 3. The key really was that we have to be able to tell an amazing story no matter what: whether you're a new player, whether you're

## Show and tell

We stumbled upon an interesting admission when we asked Mac about his thoughts on perfecting the balance between 'showing' story and potentially expositional 'telling' in games such as Mass Effect 3. "Honestly, that's something as an industry but definitely as a company we're, to some degree, struggling with, but also working towards. And it's something that I've been pushing for since Mass Effect. I don't think we've found that perfect balance. I think it's something we can totally improve on going forward. I think we still do tell more than we show. And some of that is also a limitation of the technology. If we were to show as much as I would like, it would probably kill all our cinematic people because they'd be like, 'We don't have time, we don't have time!' And, literally, they wouldn't. But I think it's something we can work towards in the future."

a returning player, whether that person's alive, whether that person's dead. So the key really was on, 'Tell me a compelling story first on a mission.' When we do peer reviews, some people play it when that person's alive and some people play it when that person's dead, and you've gotta have both and make sure it feels great no matter what."

## Telemetry is overrated

For anyone who followed the post-launch news surrounding Mass Effect 2, you may well be aware that BioWare released a bunch of information taken from telemetry data that allowed the developer to monitor how people were playing the game. A more common occurrence in the gaming industry nowadays, this practice tends to guide developers towards game design decisions in subsequent titles. At BioWare, though, Preston Watamanuk, creative director for the Mass Effect series, felt that







telemetry data should be used in a less influential way for Mass Effect 3.

"I think the best way to put it is that telemetry informs our decisions, not decides our decisions. Meaning, for instance, a large percentage of people play Paragon; larger than not. But somebody might come back and say, 'Why would you put new Renegade moments in the game?' Well, it's evenly balanced still. It's just what that informs us about is that we really have to watch the quality of the Paragon interrupts that we're putting in and making sure they're as good as they can be because we know that the majority of our fans will hit those moments. Half the fun of being able to be a good guy is knowing that you could be a bad guy. So it's just as important that we do both. And that's where telemetry is actually helping us make the game better but it's not making decisions for us; it's just helping us make good decisions."

## Down to Earth

Casey Hudson, executive producer and creator of the Mass Effect games, emphasised the importance of bringing Commander Shepard back to Earth; both literally and metaphorically. "We wanted to bring Shepard, as a character, down to Earth, because we didn't want to kind of get lost in making Shepard continue to be some kind of superhero. And the real interest in a story like this is Shepard is not a superhero; Shepard is just a person."

We also asked Casey about how he deals with the immense pressure and burden of faith placed upon him and his team for Mass Effect 3 by millions of gamers around the globe. His response was a mixture between taking it seriously and taking it in his stride. "Yeah, it's interesting. I'd say it's unique, too.

There are obviously games that

have huge followings and sales, but I've never seen a game where people are so emotionally dedicated to what they hope they'll see, or worrying that we're going in the wrong direction with it. That, I think, is unique to Mass Effect and it's a result of making characters that you can interact with, and that makes them real in a way that unless those characters are interactive, they're not kind of part of that type of experience. As our characters, they only exist because you might have saved their life; or they are only in a relationship with you because you've talked to them, so people take an ownership of those characters as things that are more real to them than if we just told people what they were. And that, to me, is the difference."

"So, I don't feel the pressure over what we're making because I know that we're going to satisfy all of that. But it's the in-between part where people are starting to see bits and pieces of the game and they're starting to worry that we might be doing one thing versus another. When they let us tell them the story, that's when, I think, they'll be able to relax and enjoy it."

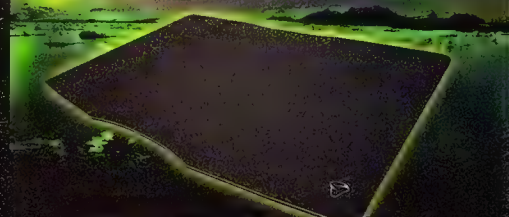


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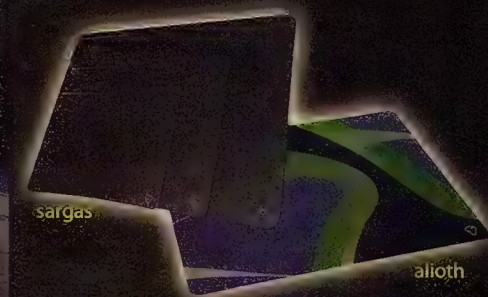


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# The Secret World

Funcom messes with the MMORPG formula.

Our first attempt to see a behind-closed-doors presentation of EA's upcoming MMORPG wasn't the most successful of outings. While the game was there, and we certainly witnessed a live play-through, the presentation was in German; for those who are multilingually-challenged, there wasn't a whole lot of context to go with the on-screen presentation.

Thankfully, round two was more up our English-speaking alley. The Secret World is set to hit in April 2012; but definitely won't be the

first of April, as our presenter joked. As tends to be standard fare of behind-closed-doors presentations, they kicked us off with a video, which set the scene but wasn't anywhere near as exciting as the live solo instance that followed.

Joel Bylos, an expat Aussie developer and lead content director on The Secret World, stepped up to provide a bit of background before the instance. A 'secret war' rages in a game world where every myth, conspiracy and legend is true, with players choosing to jump

into the skin of one of three factions: Dragons, Templars or Illuminati. Each faction has a distinct flavour.

## Different strokes

The Illuminati believe that glamour and wealth are the true sources of power, and that morality is in dire need of the Morality 2.0 upgrade. Templars are the old power that take a Team America approach to sanctifying the evil spreading in the world: they'd rather nuke a populated town that contains a single zombie molecule than risk an outbreak. Finally, the Dragon faction is the most mysterious of the bunch and adopts a from-the-shadows role, believing that an avalanche of change can be enacted by perfect timing and the smallest of influences.

Story missions will play out differently depending on which faction you choose, with the end goal being that each player's faction choice will be vindicated by the narrative. Apparently, this will make you hate the other two factions.

The live solo instance took place in a parking structure in New York. The night-time setting helped to highlight the advancements made to the DreamWorld engine, notable for powering Age of Conan. Sure, it's not exactly Battlefield 3 in terms of pretty, but the visuals weren't of the usual bland MMO variety. In fact, Joel claimed that the addition of dynamic lighting – where







shadows and light are computed in real-time rather than pre-calculated – was a first for MMOs.

## A bright idea

According to Joel, equipping a light will increase the range at which monsters can detect you, but choosing to charge into the darkness without an equipped light can result in you missing important objects or stumbling straight into enemies. While certain enemy types were drawn to the light, other creatures of the night were repelled by its radiance.

Martin Bruusgaard, lead designer on The Secret World, then talked us through an abridged version of the all-important PvP(vP) elements of the game. He informed the group that the three factions are actually united against the common threat of the rising NPC darkness. This translates to the ability for players to team up in PvE sections, but when it comes down to PvP it's all for one and the alliance is thrown to the wind.

PvP components are split in two: capturing and holding specific power locations called 'battlefields', and fighting for control of locales of larger significance, which the team are referring to as 'war zones'. The PvP locations are based around existing myths or legends. Some are

more renowned such as Stone Henge or El Dorado, while others are lesser known such as the Lost Kingdom of Shambhala. Each location is in a different part of the globe which lends itself to its own unique look and feel. Diversity is, after all, an important component in a gaming genre that usually requires scores of hours of player attention.

## All-out war

The real shining star of the presentation was the Chinese temple war zone that was shown. Over 100 players can fight against each other in the war zones of The Secret World, and Martin promised that these would require tactical thinking and team play. The Illuminati were the defenders on this map, with the attacking onus on team Dragon. But it wasn't as simple as that.

Apparently, the Templars had caught a whiff of this power play, so there was a battle going on between them to capture and hold 'onoma' wells that would allow a team to attack the Illuminati-held gate. A group of Dragon combatants managed to sneak around the main fight and capture an onoma well, which eventually allowed them to reap the five explosives required to blow the gate to the Illuminati fortress. To make matters more



interesting, the Dragon team had to protect the vulnerable bomb bearers as they made the run from well to gate.

But once inside the battle wasn't over. After fighting their way up the steps through the Illuminati defenders, the real threat was a towering automaton that was able to absorb a lot of damage as well as dish it out in turn. Eventually the Dragon team disabled the automaton and it was converted into their ally, signalling their victory at this particular control point. Best of all, this wasn't just a new bit of land for them to plant their Dragon flag in; controlling certain areas provides server-wide bonuses for the entire faction. Suffice it to say, it's well worth capturing and holding as many war zone points as possible.

There was a lot to take in during the behind-closed-doors presentation of The Secret World, but it was sufficiently complex enough to capture our attention. If you're interested in reading more, you should definitely check out the interview with Ragnar Tørnquist ([www.atomicmpc.com.au/?25772](http://www.atomicmpc.com.au/?25772)), where we discuss a lot of the other mechanics of the upcoming MMORPG. Roll on April. **NL**

PC

Developer: Funcom  
Publisher: Funcom & Electronic Arts  
Website: [www.thesecretworld.com](http://www.thesecretworld.com)



Interesting PvP;  
exciting visuals.



Lots of deep  
background to learn.

Anticipation rating

You'll need to be committed,  
but TSW looks worth it.



**81%**







# Uncharted 3: Drake's Deception

Smiling thrill-killer Nathan Drake returns for another foray into the world of competitive climbing and puzzle solving.

Is there a more charming mass-murderer than Nathan Drake? With that nineties-child haircut, half tucked shirt and aw-shucks style of wit (not to mention his penchant for throwing a M32 grenade into a crowded room of hired thugs), he's an everyman on a killing spree that we can all empathise with.

Jests aside, it's this sense of "man in the wrong place" that actually makes the Uncharted series so compelling, in much the same way it did for Infamous. When presented with protagonists that are seven-foot tall space marines, members of a long lineage of assassins and elite special forces troops from the blackest of ops, it's nice to play a guy who just wants to find some nice old things in far away countries – even if he does insist on killing most of the inhabitants along the way.

Uncharted 3 doesn't really break from the formula that made the first two titles such a success. Nate and Sully are on the trail of hidden treasures, messing with forces that should be beyond the realm of mortals, and people are intent on stopping them... or at least beating them to it. Characters return, new allies and antagonists are introduced, and massive set-pieces provide stunning back-drops to the mix of exploration, shooting and puzzle solving that everyone has come to expect of the series.

Impressively, Uncharted 3 has done a good job of not showing its age too badly. This is the first of the series where motion-capture has been performed by the voice actors themselves and it shows, with quite stunning fluidity to movements whether in game, or during the

(arguably many) cutscenes. Like Assassin's Creed: Revelations, the over-riding philosophy seems to have been that if it ain't broke, don't fix it. Unlike AC:R, Uncharted 3 hasn't just added new elements to make everything seem shiny. Puzzles are still compelling and challenging enough to be occasionally infuriating, exploration is still somewhere between Sam Fisher and Ezio (and still set in a world where lactic acid and toilet breaks doesn't exist) and shooting is still twitchy and commonplace.

Naughty Dog have arguably tidied up the hand-to-hand combat, which is still repetitive button mashing, but now varies a little in which buttons you mash and when you mash then – it's enough of a change to make Nathan's fists a weapon worth using occasionally. There are also some nice contextual twists with Nate using his long- and side-arms to augment his punching ability, as well as stripping weapons from opponents when unarmed.

Unfortunately, the frustrations haven't changed too much either – when climbing it can still be tough to work out where Nate needs to improbably leap next; enemies still seem to have an immunity to bullets to the point where multiple headshots just make them mad; and there's still the odd boss style fight that can take four or five goes to even guess what you're meant to be doing.

But despite all the above, Uncharted 3 still has an incredibly compelling story. An unspecified amount of time has passed since the second game, but this isn't made explicit in the dialogue. It's up to the player to discern some of the personal back-story from the way characters

communicate with each other. The cold opening works well and throws you into a sense of "why are we doing this", but there's only one expository flashback and it's a doozy (without spoilers, let's just say that Sully was a hell of a fox back in his youth and Nate was just as bloody cocky). Many of the smaller lines were actually ad-libbed by the actors, adding a wonderfully natural flow to the dialogue and helping new characters feel like old traveling companions.

Naughty Dog's art department also deserves multiple awards for the incredible work done on making every location feel truly unique and exceptionally beautiful. Yemen in particular is almost enough to get you off the couch and looking up travel websites.

Is this a very similar game to the first two? Yes, but that works in its favour, because the first two – despite all their metaphorical (and occasionally literal) on-rails gameplay – were good games. Drake's Deception continues this heritage of compelling characters and mostly fun gaming, elevates the trilogy into the hallowed halls of superb gaming. A worthy new adventure for Nathan Drake, everyone's most beloved smiling killer. **NH**

PS3

Developer **Naughty Dog**  
Publisher **Sony Computer Entertainment**  
Website **www.unchartedthegame.com**

**Gameplay**  
Similar to the first two, with polish.

89

**Graphics**  
Believable character animation and stunning environments.

96

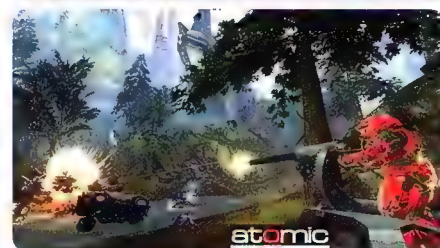
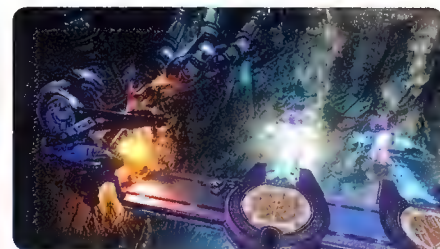
**Sound**  
Excellent incidental music and sound effects.

95

**Overall**  
Continues the series' heritage of action and adventure.

92%





# Halo: Combat Evolved

## Anniversary Edition



The original Halo gets the remastering treatment, bringing the classic up to date with modern HD graphics.

**W**e can remember reviewing a mess of launch titles for the original Xbox back in the day. We can't remember who for, and can only vaguely remember the house we were living in at the time. Hell, it was ten years ago, and it's a bit hazy. But one thing stands out clear as day:

Playing Halo: Combat Evolved for the very first time.

There is a reason why it's considered one of the greatest games of all time, and Halo pretty much singlehandedly put Microsoft's fledgling console on the map – it was a brilliantly executed essay on game design. And no wonder: Bungie had been working on the game for many, many years, and though it had changed form many times through development, not least of which the sudden, almost 11th hour shift to console, every part of the game was polished to a blinding shine.

Ten years is not only a long time, but it's also a worthy milestone to celebrate, and that's the thinking behind 343 Studio's first outing, the lovingly crafted Halo: Combat Evolved Anniversary Edition. After two sequels, two spin-offs, and an alarming amount of teabagging in Blood Gulch, it's time to go back to where the franchise started.

### Can you really go back home?

One of the selling points of the Anniversary Edition is that it's completely remastered, but basically otherwise the same game. Some might wonder, though, if a pretty wrapper on a ten year old code-base is worth anything. To

those folks, we say simply: hells yeah.

Halo justifies its remastering by remaining a legitimately great game. From the weapons (OMG, it's great to get back to the old Assault Rifle and Pistol – we missed you guys!) to the physics, you could be excused for thinking this is an entirely modern effort, even if you were completely ignorant of any previous Halo titles. It still feels like the groundbreaking shooter it was at launch.

Laid over the top is an entirely new set of textures and models. From the bright steel interiors of the Pillar of Autumn to the lush open forests of the Halo itself, the Anniversary Edition looks stunning. The textures alone make it worthwhile, but a lot of the models have been boosted, too. UNSC Marines now look like the born-again buttkickers they are, complete with their own combat armour and bulky packs, and the Master Chief still looks marvellous in his MJOLNIR armour.

Even more impressively, the sound has had a complete overhaul. The music remains the same, but has had a full orchestral makeover, and sounds better than ever. The absolute best bit about the new sound work are the weapons; our beloved Assault Rifle now looks and sounds like the beast it is, and combined with the improved work on model textures and blood splatter, the exploits of the Chief now feel even more epic.

### Not just a cash-in

The best thing about coming back to the game for me is the impact of knowing not only how the story of Halo: CE progresses, but also how the whole conflict began. Seeing the Pillar of

Autumn make its narrow escape from Reach, then going directly into a modern-looking continuation of the story in the Anniversary Edition makes Halo a bigger experience, not a lesser one.

In terms of seeing where the game's come from, though, one element stands out as a genius touch. With a single button push, you can reload the original game's textures and models, and for anyone who's keen to really understand just how far we've come in ten years, it's a brilliant addition to the game. Hell, it's even still playable!

One of the biggest compliments we can pay to the game, however – which you may of course take with a pinch of salt – is that even in this season of AAA releases such as Skyrim, Battlefield 3, MW3 and more, Halo still stands out as a game that demands attention. It's certainly gotten ours. **DH**

#### Xbox 360

Developer 343 Industries  
Publisher Microsoft  
Website <http://halo.xbox.com>

**Gameplay**  
Still groundbreaking after all this time.

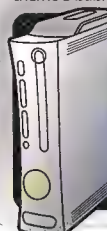
98

**Graphics**  
Looking better than ever.

89

**Sound**  
We want to have the Halo theme's babies.

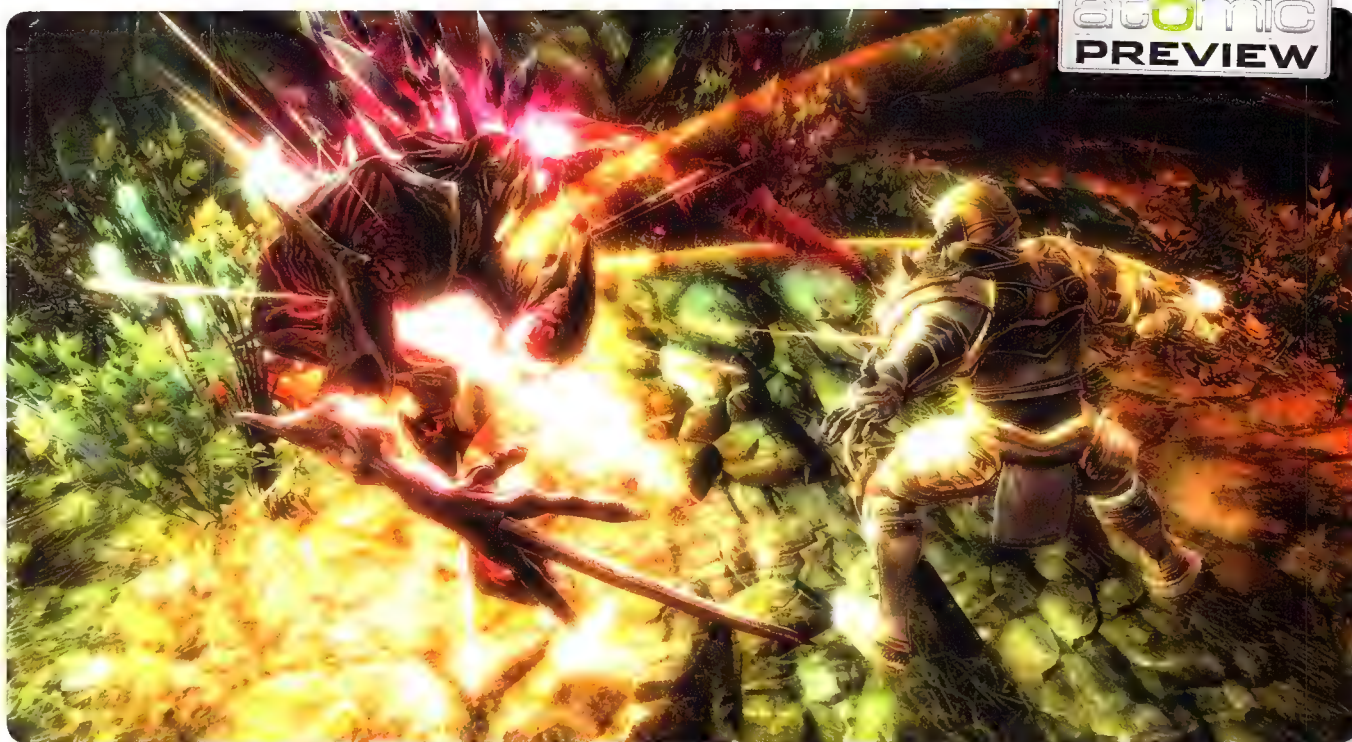
96



**Overall**  
A great update to a classic.

91%



atomic  
PREVIEW

# Kingdoms of Amalur: Reckoning

A hands-on session with Reckoning reaps some interesting results.

In our last Kingdoms of Amalur: Reckoning preview ([www.atomicmpc.com.au/?279041](http://www.atomicmpc.com.au/?279041)), we wished we could get more hands-on time with the game. We recently got our wish during a hands-on session that gave us a couple of solid hours with the game.

In many ways, the timing was perfect. Having played dozens of hours of Skyrim in more recent weeks, we always felt that Reckoning was going to be compared against it.

We got to play from the start of the game, thankfully on a PC version of the game that had keyboard & mouse, as well as an Xbox 360 gamepad. Big Huge Games deserves kudos on the controller front, as switching between gamepad and keyboard & mouse is as simple as moving your hands from one controller to the other. Reckoning detects what input you're using, and the game continues on.

## The usual epicness

The opening cinematic was sufficiently epic in a Lord of the Rings way, while the character creation screen was more streamlined, in that there wasn't the standard daunting range of nit-picky options on offer. There was, however, still enough to make our character feel personalised.

The highly stylised cartoony graphics were visually engaging and demanded attention from the outset. When you combine the visual aesthetic with the animations and character poses, it all starts to feel like pages ripped

from a dynamic comic book. This was most apparent during combat, but when we swung the camera around 180-degrees on our character during the quieter moments, his default stance made him look as though he was ready to take on Superman.

Given our comparatively limited time with our first hands-on with Reckoning, we were keen to road test the hell out of combat, which visiting Big Huge Games developer Ian Frazier believed to be best in class for RPGs.

The first section, understandably, worked

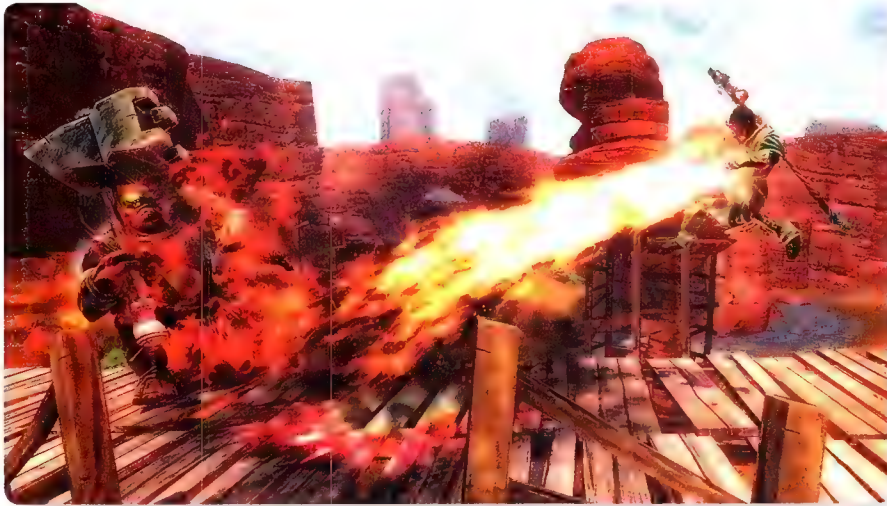
as a tutorial for Reckoning's combat system. We could block, evade, and make use of two weapons as well as magic. The more we levelled up, the more combat options were unlocked such as magic spells, or extra attack options for melee weapons. But this is where things got a bit controversial.

## Control issues

You'll essentially want to have a gamepad connected to your PC to get the most out of the multi-weapon combat. When using a







keyboard & mouse, players can use primary attack (left mouse button by default) and magic (right mouse button by default), but are forced to use the mouse wheel to scroll to the secondary weapon (be it a bow, magic-infused staff or daggers). Conversely, if you use an Xbox 360 controller, you'll be able to use primary attack (X) secondary attack (Y) and magic (holding a trigger + A, B, X or Y) in a free-flowing manner. This allows greater control over your primary and secondary attacks, which are incredibly useful during combat. Granted, the keyboard grants access to submenus via single hotkeys and spells can be bound to numbers 1-9 – functionality that the limited buttons of a controller cannot offer – but this still seems like an oversight given the emphasis on fast-paced combat.

When we asked Ian about this, he said that this decision was a result of play-testing and that we shouldn't expect this to change for the final version. Despite this, the combat was responsive, fluid and a hell of a lot of fun. Action junkies will love the inherent skill required to best a group of enemies in combat. Although it starts off easy, the difficulty quickly ramps up when taking on swarms of more powerful foes. It requires careful timing to block attacks,

which activates a slow-mo parry for easy counterattack options, and understanding enemy susceptibilities to weapon/magic type is crucial for exiting frays in one piece.

## Balanced combat

It's clear that Big Huge Games has put an emphasis on fast-paced combat, particularly considering the lack of manual aiming controls for magic and bows. We were initially against this, but when we got used to the idea of being able to equip a bow as a viable secondary weapon that could be quickly used during combat, we warmed to the approach. The most impressive facet of the combat was a technical detail that many have failed at: an intuitive camera. The camera angle subtly changes during a fight so that all enemies are visible on-screen at a time. It worked really well, and meant that we never felt cheated by attacks from enemies we never knew existed.

But combat wasn't the only thing on offer in our time with Reckoning. Inventory was limited to slots, not by weight, which made looting very straightforward. We dabbled in a bit of lockpicking, which hasn't changed much since the myriad of other RPGs that offer the mechanic (not that it has to), while the ability



to break down items for crafting was an early ticket to scoring better weapons than could be initially found in the game world. A new Dispel Ward mini-game required us to find totems in the game world that simultaneously test reflexes, awareness and timing in order to access an experience boost.

Then, of course, there was the main storyline and subsequent side quests that were scattered everywhere. Thankfully the main quest was actually compelling; but then, they'd be doing well to screw up the idea of a fateless hero brought back from the dead who's seen as the last hope for battling an evil ruler who has a penchant for genocide.

## Rough edges

As far as spit and polish goes, there were some regularly noticeable graphics rendering pop-in going on (granted, the PC didn't have its settings maxed out), with the odd clipping issue and sporadic AI fails. But there's no reason why these issues can't be ironed out before the final product ships. What probably won't be changed, though, is the abundance of invisible walls that were around every corner. While stopping us from falling off a cliff seems like player-friendly design logic, the inability to drop 30 centimetres onto the ground or water below is frustrating and unnecessarily restrictive in a gaming genre built on freedom and choice.

We left Reckoning wanting more despite the aforementioned gripes, which is an impressive achievement considering the dozens more hours of gameplay still left in Skyrim. Reckoning goes on sale on February 9 2012. **NL**

PC, Xbox, PS3 (Previewed on PC)

Developer: Big Huge Games  
Publisher: Electronic Arts  
Website: [www.reckoning.com](http://www.reckoning.com)



Fast-paced combat; compelling quests; engaging graphics

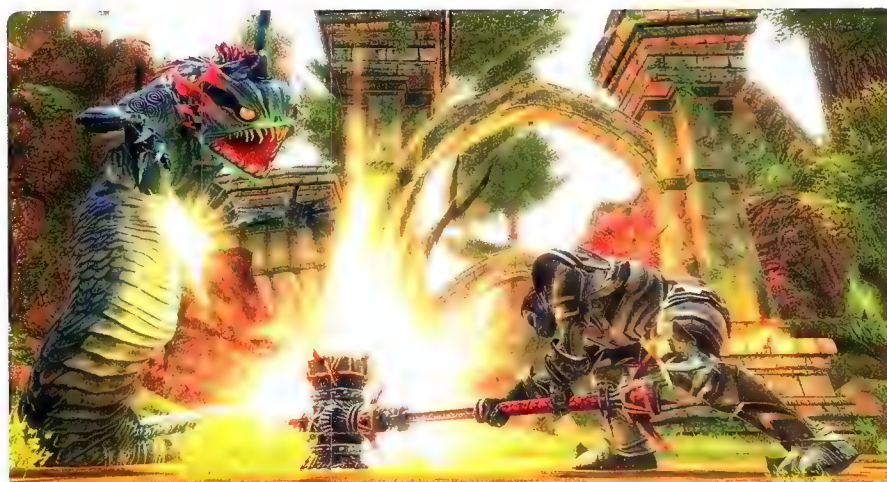


Some AI issues; lack of freedom in some areas.

Anticipation rating

We reckon Reckoning will be a fun way to start 2012.

**86%**







# Star Wars: The Old Republic

We may not have a release date in Australia, but that hasn't stopped us from sneaking a peek at The Old Republic...

In reality, there's really only one intellectual property that could take an MMO-swipe at the Kingdom of WoW, and that's Star Wars. This has, of course, been attempted in the past with Star Wars Galaxies, but that really didn't amass an army big enough to topple World of Warcraft from its spot at the top of the ladder. If George Lucas taught us anything about Star Wars, though, it's that the world never tires of seeing it adapted many, many times.

To be fair, it is the mighty BioWare pulling the strings on The Old Republic, which immediately suggests a high base level of quality; at least on paper. But the problem is that we Aussies don't know when we're going to see ToR officially released on our shores. Of course, this won't stop savvy folk from playing it, and some of you may already be involved in the beta (if so, please post your thoughts at [www.atomicmpc.com.au/?281517](http://www.atomicmpc.com.au/?281517)). Unfortunately, EA has essentially barred Australian press from seeing the game because they, like us, don't seem to know when we'll be seeing the light provided by the twin suns of ToR.

Even though behind-closed-doors opportunities are currently out of bounds for Down Under journo's, we still managed to get a hands-off peek in a country far, far away.



EA was playing it cocky and did a live demo of a raid that involved an attack by Sith Empire players on an ancient prison called the Eternity Vault. Before the live gameplay commenced, we were informed of some interesting points that BioWare hopes will set their MMO apart. Your narrative choices are directly linked to your class specialisations, and with a strong emphasis on players experiencing their own personalised Star Wars story, this is a fascinating point of difference.

As the eight players started taking on the first wave of Eternity Vault guards, the live demo guide provided a lot of insight into what we were seeing. A male bounty hunter, tricked out in familiar Mandalorian armour, impressed with his Swiss Army Knife-like kit: the shortlist included grappling hooks, a jet pack, and EMP capabilities. But even this bounty hunter was made to look like a toy soldier when a lady bounty hunter flew onto the screen and rained missiles on a stubborn auto-turret.

A wave of droids crashed in from the heavens and it was time for a Sith Assassin to step up to the mark with his double-bladed lightsaber and show his team how to swing. Deadly at close range, the Sith Assassin used Force Pull to draw enemies in to his kill zone, and finished them off with an overdose of Force Lightning. A final turret stood in the way as a Marauder stepped up and peddled her deadly wares. With a lightsaber gripped tightly in each hand, she wasn't there to mess around as she used Force Jump to get into close proximity and ripped into the turret.

At this point, the demo guide announced that the challenge had only just begun as the second line of defence rolled in. The presenter's

claim was immediately backed up by the appearance of a towering XRR-3 Annihilation Droid. Considering this behemoth's CV includes 'Destroyer of civilisations' on its 'Previous work' column, we were forced to re-evaluate our initial dismissiveness. Even the brutal attacks of the Juggernaut and Sith Assassin did little.

To add further proof to the presenter's claims about Eternity Vault's challenge, he ended the demo shortly thereafter as players started falling to the might of the XRR-3. A short combat montage afterwards showcased the action once you step inside the Eternity Vault, and we were ready to reconsider our anti-MMO stance. It's just a shame that we can't end this preview with a release date or window for an Australian release. **NL**

## PC

Developer BioWare  
Publisher Electronic Arts  
Website [www.swtor.com](http://www.swtor.com)



It's fooking Star Wars!; lots of action



Not coming here yet; possibly too much action

Anticipation rating  
How 'bout a release date, EA?

**80%**





# A Game Of Thrones: Genesis

Subterfuge, intrigue, nuance and flair – you'll find none of these here.

**M**other always said if you have nothing nice to say, then don't say anything at all. Unfortunately, by that barometer, this page should be blank. Alas, you *want* to know about the first computer game to inherit the Game Of Thrones title, and whether it's worth your hard-earned gold.

Well no, no it's not. If Tyrion was here, he would tell you to spend your money on wine and women. Or perhaps on some new boots. Anything at all really, because GoT: Genesis is a shipwreck.

Let's start with the visuals – Genesis is set a thousand years before the events in the books, and the graphics look like they're from the same period. While the landmass everything sits on isn't too bad, buildings and the environment can have vastly different texture qualities which stick out like a sore thumb. Units are tiny and hard to distinguish, even with their (largely indistinguishable) banners, and animations are stiff and underwhelming. Battles can be a confusing mess, obscuring what's going at times, but you'll be lucky if don't fall asleep before you get this far.

Of course graphics aren't everything, and many a game has been saved by its rewarding

gameplay – but Genesis isn't one of them.

While an RTS at its core, it plays out a little differently. There are two core phases to each game: peacetime and wartime. In peacetime, diplomacy and economics are key, and here is where the game actually innovates: you expand your empire by sending envoys to win towns and castles over, send rogues to start riots in enemy towns, hire assassins to take out enemy units, and wed off your noble ladies to create blood alliances. You can also send spies to infiltrate enemy headquarters and impersonate that player's envoys (unaware to them) so they create 'fake' alliances. It's got all the tools you need to subversively undermine and backstab, without your enemies sometimes realising it – and, of course, them doing the same to you. It's a good recipe to replicate the air of mistrust and political shenanigans that underlie the Game of Thrones, but that's where the similarity to the series ends. It doesn't really take full advantage of the rich tapestry in George R.R. Martin's work – A Song of Ice and Fire (quite a good series) – this could be A Game of My Little Ponies and it would play the same (and arguably be improved).

In wartime it somehow manages to get less interesting; the various factions carve up the map, and cities can only be taken by force using the units at your disposal – archers, cavalry, infantry and generals. Nothing much distinguishes the units, battle is resolved in a rock-paper-scissors method with one unit type besting another, and the shoddy animations make it very boring to watch.

It doesn't help that the game is bug-ridden and poorly polished. What limited voice-overs there are appear to be by the same voice actor,

missions in campaigns are doled out between pages of text and no voice acting at all, and spelling errors abound: even in the tutorial, which in itself is hard to follow, the number of basic spelling errors is embarrassing – in what you would expect to be the most playtested component.

Genesis gets bonus points for trying some innovative strategic concepts not done before in an RTS. It also gets points for... no, wait, that's about it. We wanted so much more for a title bearing the Game of Thrones moniker, but Genesis is a let-down in almost every way.

A Lannister must always pay his debts, but no amount of money is going to save GoT: Genesis from being a game we'd rather forget. **AM**

## PC

**Developer** Cyanide Studios  
**Publisher** Focus Home Interactive  
**Website** [www.agot-genesis.com](http://www.agot-genesis.com)

### Gameplay

Boring, buggy, and bland. Innovative ideas are lost in a mire of mediocrity.

33

### Graphics

2001 called and wants its graphics back.

43

### Sound

Limited, poorly done voice-overs. Music doesn't add much.

29

### Overall

We wouldn't play this if it was given away free.

35%





# Coffee, tactics, and multi-dimensional puking

David Hollingworth looks back on one of his fondest gaming memories, and gaming places...

**R**are is the game that not only is great, not only manages to glow in your memory over fifteen years later, and rarer still is the game that manages to somehow combine all that with a sense of place and a group of people.

However, *Descent*, Interplay's mind-breaking 1995 game of zero-g tunnel fighting, is just such a title.

Back in the mid-nineties in the Sydney suburb of Glebe, a net-cafe opened. It was, in fact, one of the first in the country, and it was packed with awesomely powerful PCs all networked together. It also served some pretty tasty cafe food, and the barista at the time was a close friend. My group of game-playing friends had just discovered *Descent*, and it seemed like a match made in heaven.

First, though, if you don't remember *Descent*, or have never heard of it, it probably pays to bring you up to speed. It had a simple premise – you're sent into a series of zero-g mining complexes to rescue workers and destroy said mine after it's been taken over by virus-infected robots. You're piloting a small fighter craft. Pretty standard fare, but the game's kicker was the full



for epic fragging was irresistible.

Thus, when Well Connected, the aforementioned net cafe opened, it seemed too perfect an opportunity.

So, fuelled by the most wicked quadruple-shot coffees our barista buddy could make (shakes were a common side-effect), we gamed long and hard. Tactics evolved on a near hourly basis – someone would come up with a game-winning strategy, dominate for a time, and then be outstripped by some counter-move. I think I learned more about interactions of zero-g bodies



## You're piloting a small fighter craft. Pretty standard fare, but the game's real kicker was the full six-degrees of motion you could explore in the twisting tunnels of the mine.

six-degrees of motion you could explore.

Combined with some complex levels, the game was mind-bending. A common experience was to find yourself contorting your upper body to match on-screen movement as you flipped upside-down, thrust sideways, fired a missile, then hovered back around a corner and into cover. Arguably the most important control of all was the single-button press that would return you to a level attitude!

However, as engrossing as the singleplayer was (and it looked good, too, with an incredible lighting engine for the time), the game came alive in multiplayer. It followed the standard of the time – arbitrary arenas with scattered weapon upgrades about the joint), but the freedom of motion, and the fact that many of the weapons had considerable flight time, made for some compelling play. And since even though the share house I lived in at the time was highly compute-heavy (it had two Macs and an Amiga), the pull of getting a whole eight players together

in those gaming sessions than I could from a lifetime of physics study.

But one thing really sticks in my head. One of the people we played with – a flatmate at the time – had a wicked sense of spatial awareness, and a wonderful ability to read another player's reactions. She simply pwned at that game. She'd fire off a missile at me, then re-position and start shooting at an empty bit of space; in moments, I'd see the missile, react with a dodge, and start to come about for a return shot, only to discover I'd flown right into her fire-arc.

Cackling would follow. If she reads this, I guarantee she'll be maniacally laughing at my limited grasp of three-dimensional combat mechanics.

Seriously fun times.

The other day, after wandering down Glebe Pt Rd – which I hadn't done for a while – I noticed that Well Connected had closed. And man... it made me sad. ☹️





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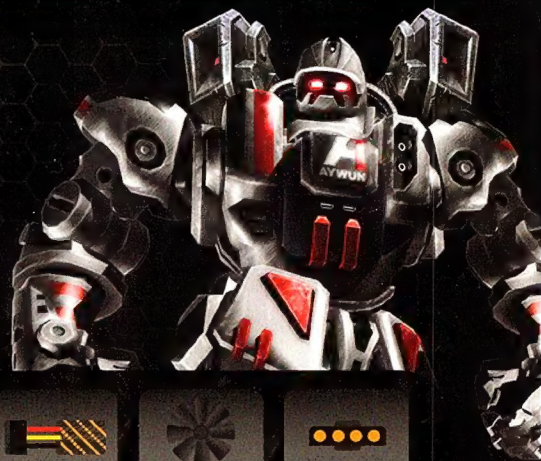
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